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Agricultural Gazette of New South Wales.

The Conservation of Soil Moisture.*

Lecture, Illustrated with Lantern Slides, at Conference of Wheat-growers, 18th July, 1910, by

R. D. WATT, M.A., B.Sc., F.C.S., N.D.A. (Hons.), N.D.D., Professor of Agriculture, University of Sydney.

MR. PRESIDENT, LADIES, AND GENTLEMEN:

I consider it a very high honor, as well as a very great privilege, that I have been asked to deliver the first lecture in connection with this important Conference; and I have to thank you all for the cordiality of your welcome to one who is almost a stranger to most of you.

Twelve years ago, when Sir William Crookes, the great scientist, was President of the British Association, he delivered a very startling presidential address, in the course of which he said that by the most careful calculations he could make he could only come to one conclusion, namely, that by the year 1931 the wheat supply of the world would be just sufficient to meet the demand; or, in other words, that if all the wheat land in the world that is available were taken up, twenty-one years hence it would only produce sufficient to supply the needs of the increased white population, unless the average yield per acre could be increased.

Well, this was rather a serious matter. Fortunately for us, a great many things have happened since then to put the evil day farther away. One of these is this: In humid climates, like that of England and the Continent of Europe, the success of wheat-growing depends largely upon the supply of a fertiliser containing nitrogen. Twelve years ago it looked as if the world's supply of nitrogenous fertilisers was very small, and that by the year 1931 that would also be pretty well exhausted. Fortunately, science has come to our aid, and to-day we have two nitrogenous fertilisers, manufactured from the unlimited supply of nitrogen in the atmosphere, and so we can breathe again.

Extension of the Wheat Belt.

There is another factor which he did not consider. He took it for granted that it was impossible to grow wheat successfully on areas where the rainfall was under 20 inches. Now, with improvements in our varieties of wheat, and with improvements in our methods of cultivation, we have been able to grow wheat in America, in South Africa, in Australia, and in other countries with a rainfall of less than 20 inches. But in spite of all these factors, you will see that the outlook is not too pleasant.

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* From Farmers' Bulletin, No. 42—"Conference of, Wheat-growers, with Special Reference to Dry Farming." Copies of the complete Bulletin may be obtained free by farmers interested on application to the Under Secretary, Department of Agriculture, Sydney.

A distinguished British statesman, re-echoing the sentiments of the King of Brobdingnag, once said that the man who makes two blades of grass grow where one grew before is a benefactor of his country, and I think you will agree with me that he spoke truly. And I think you will still further agree with me when I say that the man who makes 25 or 30 bushels of wheat grow where 15 grew before, or the man who makes 10 bushels of wheat grow where none grew before, is not only a benefactor to his country but to his race. That is why I find it rather hard to understand why there should be such difficulty in raising a paltry thousand pounds to perpetuate the name and continue the work of William Farrer. (Applause.)

I believe that the progressive farmers of New South Wales, and of Australia generally, deserve the title of benefactors, in the sense in which I have used the word, and I believe that they are going to deserve it still more as the years go on; for I believe that you are going to not only increase the wheat yield in what is at present known as the wheat belt, but that you are going to grow wheat in the regions beyond.

Three Main Factors.

There are three main factors, apart from the energy and capability of the Australian agriculturist, which are helping us towards this desired end, and will help us still more in the future.

One of these I have already alluded to, the production of new varieties of wheat suitable to our conditions; with which I would associate the study of plant diseases like rust and bunt.

The second is the conservation of fertility, which is going to be brought about by the proper use of manure, and I think, by degrees, by the gradual introduction of a suitable rotation of crops.

The third factor which is going to be of importance in bringing about this desired end, is the subject of my lecture to-night, namely, the conservation of soil moisture; and, perhaps, it is not the least important of the three.

Meaning of the Term.

Some people wonder what is meant by "The Conservation of Soil Moisture." Every farmer recognises the importance of moisture in the growth of crops. Well, moisture for agricultural purposes can be conserved, or preserved, or retained, or held, by two chief means. One of these is to conserve the moisture derived from the melting of snow, and from rivers, in huge reservoirs, and to use this for irrigation purposes. But, of course, that can only be applied to a limited extent.

There is, however, another reservoir—a reservoir to which every farmer has access—for the storing of moisture, namely, the soil itself and the subsoil; and by the conservation of soil moisture, we simply mean the making the best use of the rainfall that we get, the preventing of its loss by channels by which we

do not want it to be lost, and in extreme cases, the saving of the moisture which falls during one year, or during a part of one year, for the growth of a crop in the next year.

The Soil as a Bank.

You will, perhaps, better understand what I mean if I use a little analogy, or a parable. Supposing you are engaged in a precarious business, which brings you in a very large sum of money one week, but which for the following two or three, or even more, weeks brings you in nothing at all. Supposing, at the same time, that you have coming in an endless stream of accounts or bills for immediate payment, then you will not feel in a very happy position. You may sometimes be in a very tight corner. But you would not feel so very unhappy provided two conditions were fulfilled: Provided that your total income during the year exceeded your total expenditure; and secondly, that you had a good balance at the bank on which you could draw in cases of emergency.

That is pretty well the case with the wheat plant growing under our semi-arid conditions. It may get plenty of rain for one week, and for the next weeks, or perhaps months, may get none at all. The object of conserving soil moisture is to establish a bank balance of moisture in the soil, so that the wheat may have access to it in times of drought.

Moisture required by Plants.

I need hardly emphasise to you the importance of moisture or water in the growth of crops, and especially in the growth of wheat. You may not be aware that from 50 to 95 per cent. of ordinary green plants consists of water; and that of the remainder of the plants, a considerable portion of the dry matter is made up from water and from carbon dioxide obtained from the atmosphere. But the amount that is used by crops in that way is trifling in comparison with the amount of water which must pass through crops during their normal growth, which must enter at their roots, go up their stems, and be evaporated away as invisible water vapour from their leaves.

The following table shows the amount of water required by some common crops, under varying conditions, as ascertained by Lawes and Gilbert, of Rothamsted; Hellreigel and Wollny, of Germany; and King, of America. The figures indicate the number of tons of water required for every ton of dry matter produced:—

	Lawes and Gilbert.	Hellreigel.	Wollny.	King.
Wheat	225	359	....	....
Barley	262	310	393	774
Oats	....	402	557	665
Red clover	249	330	453	....
Peas	235	292	477	447

Professor King, of Wisconsin, as the result of an average of experiments in that State, gives the following table, showing the mean amount of water used by various plants in producing a ton of dry matter:—

	No. of trials.	Water used per ton of dry matter.	Water used.	Dry matter per acre.	Acre-inches of water per ton of dry matter.
		Tons.	Inches.	Tons.	
Barley	5	464·1	20·69	5·05	4·096
Oats	20	503·9	39·53	8·89	4·447
Maize	52	270·9	15·76	6·59	2·391
Clover	46	576·6	22·34	4·39	5·089
Peas	1	477·2	16·89	4·009	4·212
Potatoes	14	385·1	23·78	6·995	3·399
	138	Av. 446·3	23·165	5·987	3·939

Requirements of Wheat.

The next table takes the quantities required for wheat, and translates them into figures which we can easily understand.

Yield per Acre.				Water used.
Number of Bushels.	Weight of Grain.	Weight of Straw.	Total Weight.	
	Tons.	Tons.	Tons.	Acre-inch.
15	·45	·675	1·125	4·498
20	·60	·90	1·500	5·998
25	·75	1·125	1·875	7·497
30	·90	1·350	2·250	8·997
35	1·05	1·575	2·625	10·495
40	1·20	1 800	3·	12·

To produce a crop of 15 bushels per acre, 4½ inches of rain are required to pass through the crop. For every additional 5 bushels you will see that, roughly speaking, 1½ inches of rain are required to pass through the crop. That is to say, other things being equal, 1½ inches of rain passing through a crop mean an addition of 5 bushels per acre. Of course, under varying conditions you will not get things to work out so mathematically exact as that, but the figures give an idea of the amount of water required by crops. To get 40 bushels per acre, 12 inches must pass through the crop.

Fig. 1, taken from Hilgard's "Soils," shows how the yield of wheat, other things being equal, depends on the amount of moisture supply. The experiment was only carried out on a small scale, but it illustrates the point very well.

Mr. S. Fortier took six tanks, placed in a field, level with the ground, and grew grain in them. One received only the natural rainfall, but the others received, in addition to the natural rainfall, a certain amount of water added as irrigation water by pouring it over the surface. The top columns represent the yields obtained in the different cases. The black part represents the yield of grain, and the white part the yield of straw.

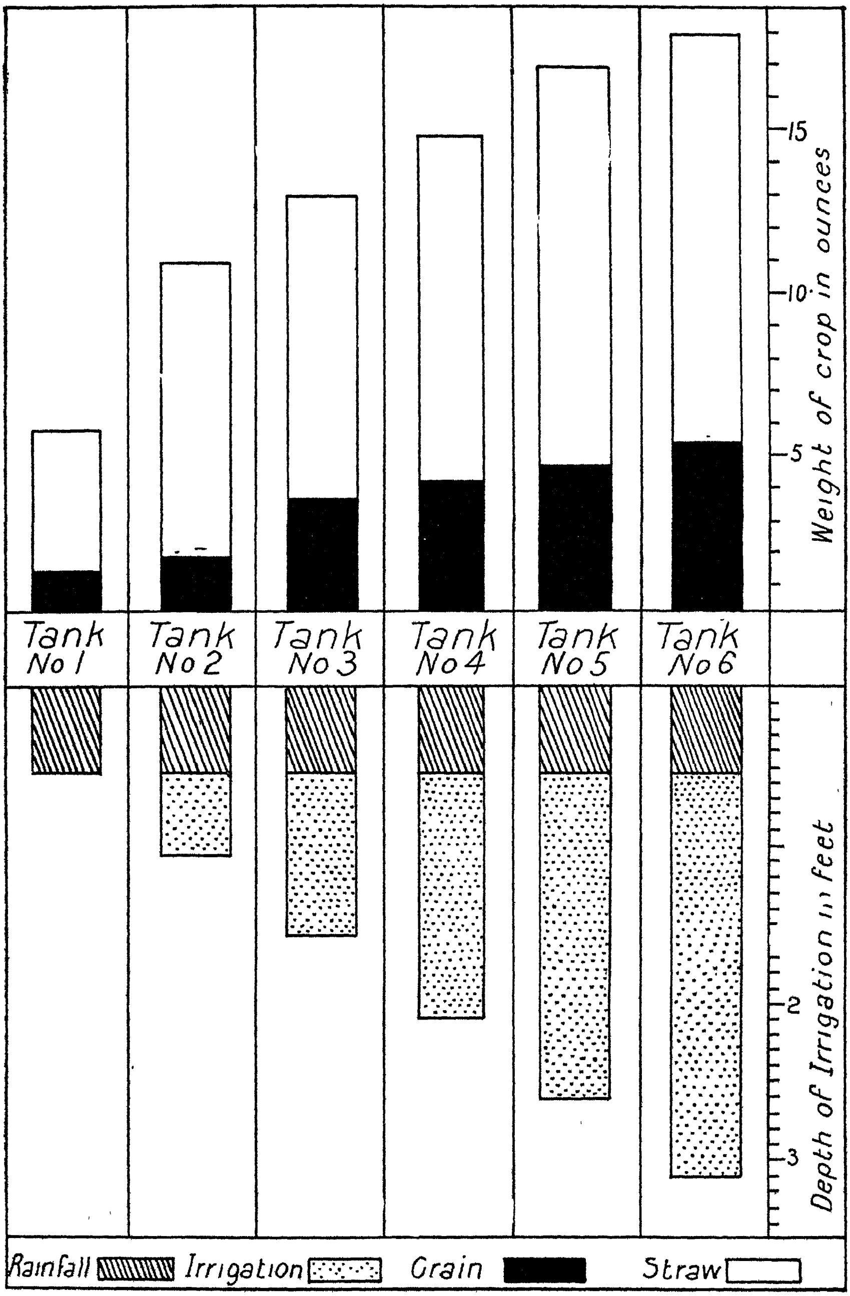


Fig. 1.—Experiments on cereal production with various amounts of water.
(Fortier, Report Mont. Expt. Sta., 1903.) *After Hilgard.*

It will be seen that where no irrigation was used the crops of both grain and straw with 5 inches of rain were comparatively small. Where a little additional water was applied, the yield of both grain and straw went up, and so on. The greater the amount of water added, the greater was the amount of grain and straw produced.

Root Hairs.

How is the water absorbed by crops? I have said that a large amount of water is necessary to pass through crops in order to bring about normal growth. Water is absorbed not so much by the surface of the roots as by little root hairs which protrude from the surface of the roots growing in the soil. You know that if you pull out a young seedling, such as a seedling

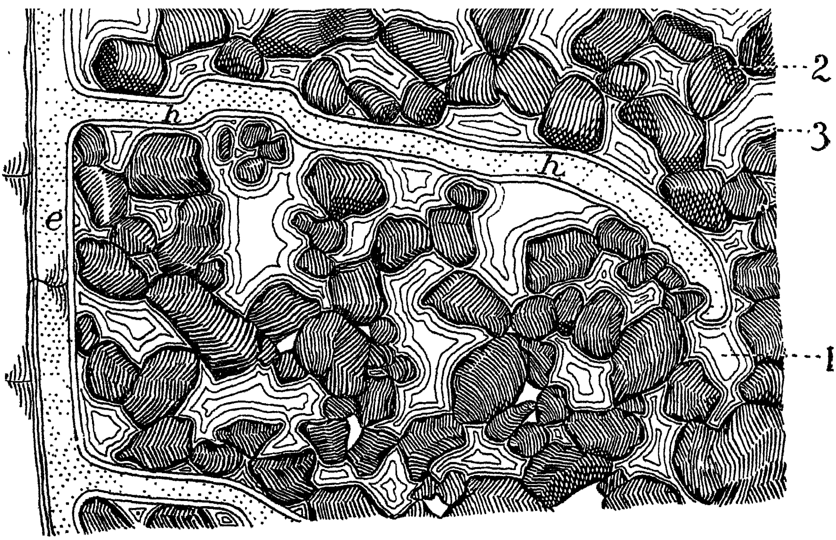


Fig. 2.—Distribution of water on the surface of soil grains and of root hairs.
e, main root; 1, air space; 2, soil grain; 3, film of water; hh, root-hair.
After Sachs, from King.

of mustard, you will find that the soil particles stick very closely to it, and you will probably think they are sticking to little fibrous roots. As a matter of fact, they are sticking to something smaller—to little tiny root hairs, which form a velvety surface on comparatively young roots, and it is these hairs which absorb moisture from the soil. Fig. 2 shows a very tiny root in the soil, with the root hairs attached. Of course, they are magnified.

Extent of Root Systems.

I do not think people properly realise how great the root systems of plants are. I have seen comparatively very few measurements of the total length of roots of a single plant, but these surprised me. Percival, in England,

measured the total root system of an oat plant growing under normal conditions, and found it to be 150 yards. That is not counting the root hairs, which multiply the surface where they are growing twelve times.

King, of Wisconsin, took out of the soil four plants of maize which were growing together, and washed the soil carefully away from the roots, and found that the total root system of these four plants was over a mile in length. Each plant had a quarter of a mile of root system. That gives an idea of how the plant is adapted for absorbing moisture.

Air and Water in the Soil.

Fig. 2 shows how the soil is adapted for the moisture to be absorbed. This is a very instructive picture. It is a view of a very small quantity of soil magnified to a very great extent, with a root hair growing out from a root into a moist soil. The soil contains the right amount of moisture for ordinary plant growth. The root hair is so small that you can hardly see it with the naked eye. In thickness it would be about $\frac{1}{100}$ of an inch. The spots are not clods, but tiny particles of soil, so small that you can hardly see them with the naked eye. This is a natural soil, under natural conditions. The lines represent moisture grouped around the soil particles, and the parts left white represent air in the soil. These are ideal soil conditions for the absorption of water and of plant-food material from the soil by a plant.

The pore space, or the space not occupied by the particles in a soil, may be as much as 50 per cent.; and the best conditions in a soil for plant growth are when one-half of the pore space is taken up by water and the other half by air. Under these conditions, not only does the plant do best, but the changes brought about by microbes in the soil to render the plant-food available can operate at maximum rate.

I use this illustration for several reasons. It might surprise you to know the amount of surface area that you would have in a cubic foot of soil—the amount of surface area around which moisture can cling. The amount of surface around which moisture can cling in a cubic foot of soil has been very carefully calculated, and found to vary from $\frac{1}{4}$ acre to 4 acres. Under normal conditions, it would be a surface of from 1 to 3 acres. Not only the plant, then, but the soil also is adapted to the absorption of moisture.

Moisture exists in the soil roughly in three states:—

(1) Hygroscopic moisture.—This is the amount of moisture which is contained in a soil which is dried by exposure to the atmosphere. It is not very much. It varies in different soils, and it is of no practical value to the plant.

(2) We may have all the pores in the soil completely filled with moisture. Not only are the particles surrounded by a film of moisture, but temporarily all the openings amongst the soil grains are filled with moisture. That is an unhealthy state, because the plant requires air as well as moisture.

(3) Where the moisture surrounds the particles of the soil in a thin film, the roots have access to air as well as to moisture, and the bacteria have access to air and moisture.

This will explain the difference between hygroscopic and film or capillary moisture. In a very dry year in California it was noticed that in different soils different crops were behaving differently, and observations were taken of their growth, and at the same time the amount of moisture in the soil was determined.

On a very sandy soil wheat was making a very poor growth, and there was little wonder expressed when it was found that only 2·6 per cent. of moisture was in the soil, of which 1·9 per cent. was hygroscopic, and could not be used by the plant; so that only 0·7 per cent. of free water existed in the soil.

In a sandy loam soil the growth was good. The total percentage of moisture was 12·8, of which 5·6 was of no use. Still, there was 7·2 per cent. available, which meant a healthy growth of the crop.

The curious result was when a clay soil was examined. The wheat plants were actually dead, and yet the soil contained 14·1 per cent. of total moisture. Of that, however, 10·5 per cent. was hygroscopic, so that the plant could not use it. Still there was a reserve of 3·6 per cent. of free moisture, and yet the plants were dead. As moisture moves very very slowly in a stiff clay soil, it could not move towards the plant-root hairs quickly enough for the successful growth of the crop.

Surface Tension, or Capillarity.

I will take a little trouble to explain what is meant by surface tension, or capillarity. Without some knowledge of that principle it is impossible to understand how moisture can be conserved in the soil.

If we take three glass tubes, very thin and of different diameters, and put them into a basin of water, we find that the moisture stands at a higher level inside the tubes than in the vessel outside. That seems strange to those of us who are accustomed to the idea that water always seeks its own level. The force which causes this moisture to rise up is what is called "capillarity" or "surface tension." It is rather difficult to explain in non-technical terms, but surface tension is that property of a liquid which makes it act as if there were a stretched elastic band over it. That is why a rain-drop is round. It always tends to get into the smallest space possible, as if there were an elastic band stretched round it. That is why, if you place a clean needle on the surface of water, it will float. It acts as if there were an elastic membrane stretched over it.

Now, in this case we have a pull acting upwards, and that is associated with a surface that is curved like that. You can imagine the elastic band stretched over that surface, sucking the water up, and the thinner the tube the higher the water rises—the greater the distance the water is sucked up. That is in a case where the liquid wets the tube, as in the soil. With quicksilver, where the liquid does not wet the tube, the opposite happens. (See Fig. 3.)

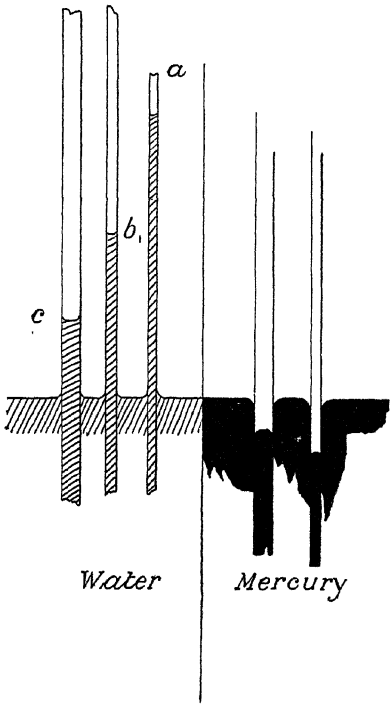


Fig. 3.—Capillary rise and depression of liquids in glass tubes.
After Hall.

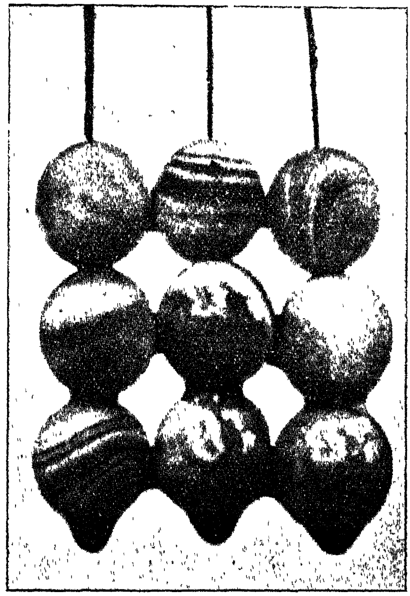


Fig. 4.—Photograph illustrating liquid film round soil particles.
After Hall.

Fig. 4 illustrates how moisture exists in the soil. A number of spheres were taken and dipped in oil and then suspended freely. The oil would not all run off. Some of it would gather at the bottom, but a film would remain around the particles, which is easily seen where two particles are close together, and where the action of gravity is greatest the films will be thickest.

Fig. 5 explains best what is happening in the soil. These are supposed to be three very minute particles of soil with a thin film of moisture around

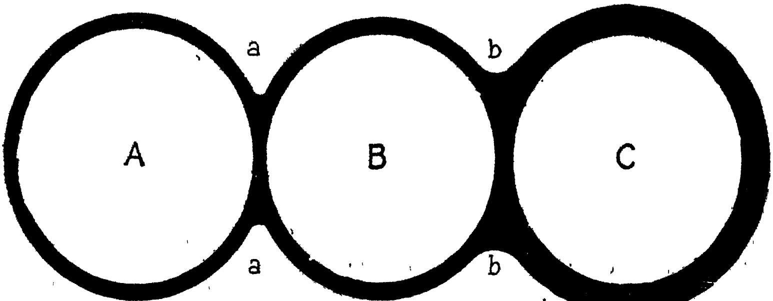


Fig. 5.—Diagram illustrating liquid film round soil particles.
After Hall.

them. The film around the one on the right is thicker than that around the one on the left. That could not exist for long in a state of nature, because the whole film acts as if it had an elastic band. The liquid would tend to be pulled towards the particle where the film is thinner, and where the curvature is more acute.

That is how moisture moves in a soil. If the three particles had all the same thickness of film and some of the moisture was removed from one by means of a plant-root, by withdrawing some of the moisture there is a suction created which draws the water, even against gravity, towards the place whence the moisture has been removed. A root growing in a soil and absorbing moisture, therefore, causes the whole of the moisture around the particles of soil in the neighbourhood to move in the direction of the root itself.

Rise of Water in Soils.

Moisture, then, moves in soils by what is called "capillarity," or "surface tension," and it moves at different rates in different soils. For instance, Fig. 6 shows an experiment carried out to demonstrate how moisture moves in different soils in as nearly as possible the same state of consolidation. These are tubes filled with soil and dipping down into water. In a very sandy soil the water rises very quickly by capillarity. In an hour it rose 8 inches; in twelve hours, 13 inches; but it never exceeded about 17 inches in six days.

In a sandy loam soil, finer grained than the first one, the moisture did not rise so quickly at first; but in one hour it had gone a little higher than in the sandy soil, and in eighteen hours it had risen 26 inches. It continued to rise for 125 days, when it reached nearly 4 feet.

Then comes a silt soil, more or less of a clay loam nature. The moisture was found to rise much more slowly; in an hour it had only risen about 2 inches, and in twelve hours it had not risen much further than it had in the others in one hour. In the end it rose highest of all. In 195 days it rose over 4 feet.

In a very clayey soil the movement is very slow. In an hour it had only risen a fraction of the distance it had in a sandy loam soil. In twenty-six days it had not risen as high as it did in one day in the sandy loam soil. However, it reached nearly 4 feet in 195 days.

These are instances of moisture rising from a wet soil into dry soil. Of course, if it had been rising into moist soil it would have risen much further, and therein lies the great hope of conserving soil moisture. Supposing the columns had been moist all the way up. Moisture would have continued to rise even from the sandy soil to a very considerable height, provided it was evaporated at the top. Experiments have shown conclusively that in a sandy loam soil moisture has risen 10 feet and been evaporated away from the surface, where there is a continuous film of moisture around the soil particles.

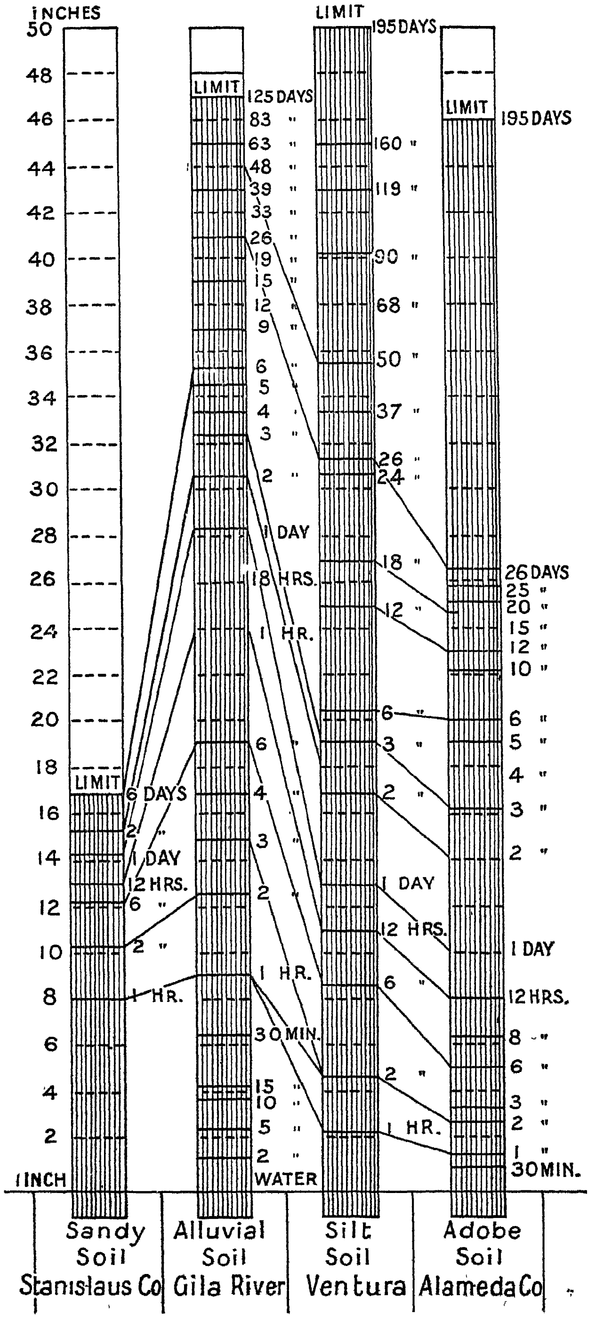


Fig. 6.—Columns showing height to which water will rise by capillarity in soils of different physical composition, and rates of ascent.

After Hilgard.

Sources of Soil Moisture.

Having explained these principles, we come to how soils may gain moisture. I need hardly tell you that the chief means is by rainfall. But sometimes moisture will rise from below. Unfortunately in our semi-arid districts the level of permanent water is a good way down, and I fear that in the wheat-growing districts of Australia we do not gain much from permanent water existing in the ground below. There may be a temporary level of saturated soil where a clay band interferes, but the chief source of our supply is the rainfall. Of course, there is a small amount condensed as dew, but it is hardly worth talking about. The rainfall is the chief source of our moisture supply.

Fig. 7 shows how the rain percolates into different soils at different rates. We find that the same order is preserved. In sandy soils the rain penetrates most quickly; in the medium soils at a medium rate, and in clay soils much more slowly.

Deep Ploughing.

To get rain into the soil is the first problem. First of all, plough deeply, where practicable. I know your conditions fairly well now, and I do not want to recommend too deep ploughing, because, under certain circumstances, it might do positive harm, and in a great many circumstances it would not be any more profitable than comparatively shallow ploughing. At the same time, I want to emphasise the principle that deep ploughing will, undoubtedly, help the entrance of rain into the soil. Keeping the surface loose is another important matter, and subsoiling where necessary; but that would hardly be practicable in a great majority of the soils where wheat is grown, though it is largely done for fruit-growing.

Loss of Soil Moisture.

The next important consideration is how moisture may be lost from the soil. It may be lost, as I have said, by passing through the crop. That is where you want it to go. It may also be lost by passing through weeds. Weeds rob a plant of moisture as well as of plant-food material. The moral of that I need hardly point out.

Water may also be lost by percolation—by running down through the soil; but I think that that source of loss is not so very common in our semi-arid countries. From my observations in South Africa, I should say that it is a matter of somewhat infrequent occurrence. Moisture is not often lost by percolation too far into the subsoil to prevent it rising again. It will only happen to any great extent when there is a band of coarse sand or gravel through which it can get down but through which it cannot rise again, or some similar structure at some depth in the soil.

Evaporation.

The great source of loss, which is partly preventable, is evaporation from the surface of the soil. An immense amount of water in our semi-arid districts disappears as invisible vapour by evaporation from the surface of the soil during the growth of the crops and when they are not growing. The

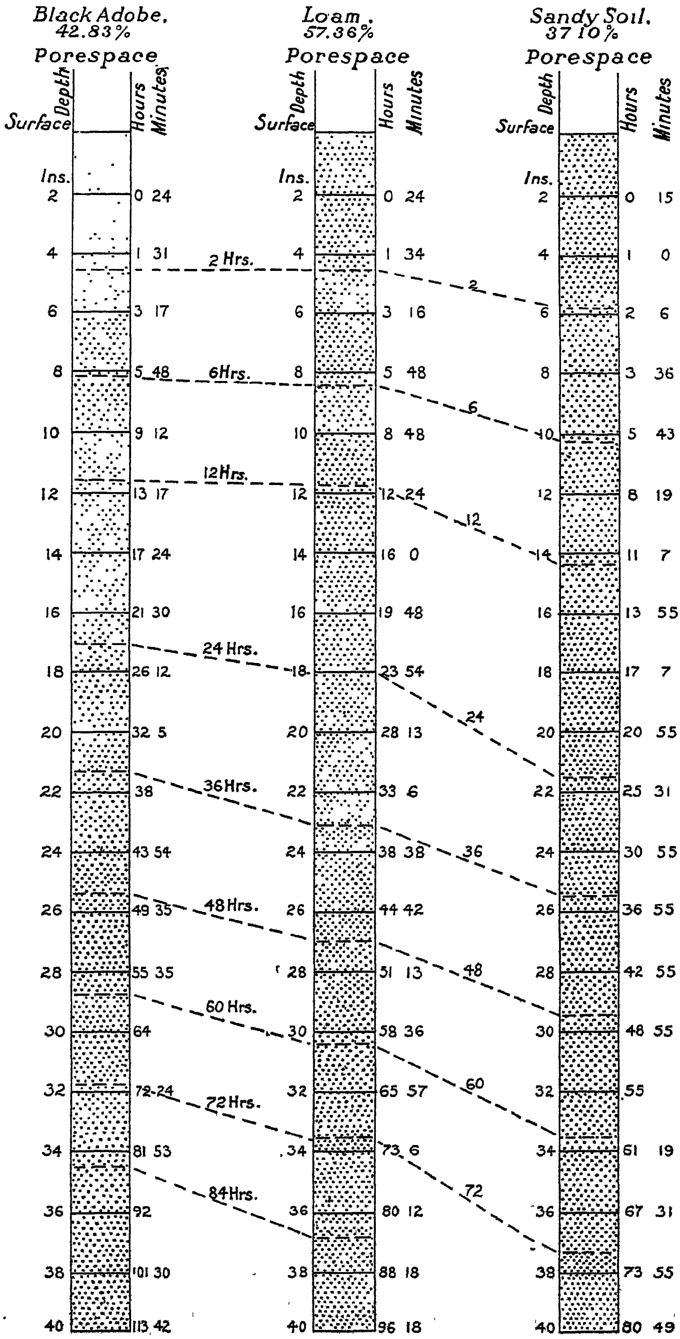


Fig. 7.—Diagrams showing differences in rates of percolation through different soils.[7]
After Hilgard.

factors which influence this evaporation are the temperature of the atmosphere, the dryness of the atmosphere, and the velocity of the wind, over most of which we have very little control.

Evaporation differs very greatly in different countries. Hilgard gives the following table showing the amount of evaporation from a water surface, not from a soil surface, in several different places :—

TABLE showing Evaporation from Water-surface exposed in Shallow Tanks near Water or Ground Surface.

	Years.	Inches.
Rothamsted, England	9	17·80 (16·6 to 18·4)
London ,,	14	20 66
Oxford ,,	5	31·04
Munich, Germany	?	24·00
Emdrup, Denmark	10	27·09
Cambridge, Massachusetts	1	56·00
Syracuse, New York	1	50·20
Logan, Utah	1	52·39
Tucson, Arizona	1	75·80
Fort Collins, Colorado	11	41·00
Fort Bliss, Texas	1	82·70
San Francisco, California	......	45 to 50
Sweetwater Reservoir, San Diego, California	1	57·6
Peking, China	?	38·80
Demerara, South America	3	35·12
Bombay, East India	5	82 28
Petro-Alexandrowsk, West Turkestan	?	96·40
Kimberley, South Africa	?	98·80
Alice Springs, South Australia	?	103·50

At Rothamsted, in England, it only averaged 17·8 inches per annum over a period of nine years. In London it was 20 inches; in Germany, 24 inches. But we get quite different figures altogether when we come to the arid districts of America. It is 75·8 inches in Arizona and 82·7 in Texas. Bombay, in India, shows 82 inches. Kimberley, South Africa, has 98·8 inches of rain evaporated away in a year; and Alice Springs, in South Australia, holds the record of 103½ inches in the course of a year. The figures, as I explained, represent evaporation from a water surface exposed in shallow tanks, not from the soil itself. The question of evaporation is a different question in different parts of the globe. Our conditions are very similar to South African conditions, to certain parts of India, to Western Turkestan, and more or less to certain parts of America.

Wind-breaks.

An excellent means of preventing the loss of water is the establishment of wind-breaks wherever practicable. In going about the country I continually see trees growing in the middle of cultivated paddocks. These may have their uses, but one of their uses is not the conservation of soil moisture. But if trees were planted in the interests of future generations round about

the paddocks, or left round about the paddocks and supplemented by other trees planted, it would be a very good thing from the point of view of conserving the soil moisture. A belt of trees has a wonderful effect in preventing evaporation, more than is generally supposed. In South Africa we used to reckon that a belt of trees affected the evaporation from the surface of the soil for a distance of at least ten times the height of the tree.

Surface Mulches.

Clean cultivation I have already referred to. Weeds rob us of soil moisture. But the great means of preventing evaporation from the soil and conserving the moisture, which is at the farmer's disposal, is what is called the maintenance of a surface mulch.

What is a mulch? A mulch is something which will let rain-water down through it, but will not allow the moisture coming from below to rise through and be evaporated from the surface. For instance, in garden practice straw is often used as a mulch. Strawberry growers in the drier parts of the east of England, and potato growers in Queensland, use straw as a mulch. That is only practicable on a small scale.

Sometimes stones or gravel form a natural mulch on the surface of the soil; and I think a great many farmers do not realise how much they owe to a stony surface, provided the stones are not so large as to interfere with ploughing or other operations.

The Soil Mulch.

But these mulches are of trifling importance in comparison with the mulch which is at the disposal of every farmer. I refer to a few inches—say, 2½ or 3 inches—of perfectly dry soil, not necessarily dust, not necessarily clods but perfectly dry soil on the surface of the moist soil.

Under this heading I put fallowing. By fallowing I mean a cultivated fallow; and it is really a combination of the two principles of clean cultivation and maintaining a mulch.

What can we do in the way of maintaining a surface mulch during our ordinary practice of growing wheat year after year on the same land?

Suppose we plough very early, long before we are going to sow. The action of the plough will for the time being separate part of the surface, lay it loosely on the sub-surface, and more or less form a mulch. But if it is a long time before seed-time, and we get some rain, that will be more or less united with the soil underneath, and it may be necessary to harrow again when the ground is comparatively dry to reform a mulch, because the harrow, or the cultivator, as well as the plough, will form a mulch.

There is another case during the growth of the crop when a mulch may be produced. It is practised by a good number of progressive farmers whom I found about the country, but I do not think it is practised enough. I refer to using the harrow after the wheat is up and has a good grip of the ground, but before it has got too high. Going over the crop with not too heavy a

harrow will more or less form a mulch, which will not only prevent evaporation of moisture from the surface of the soil, but will also help the rain more readily to get into the soil.

The Value of Mulches.

The following table shows the effect of a surface mulch such as I have described. It is an experiment carried out by Professor King, of Wisconsin. He had some cylinders of soil 4 feet deep, dipping into water, through which moisture was continuously rising and being evaporated from the surface for 100 days. The evaporation was very great, as the moisture only had to go through 4 feet of soil :—

TABLE showing the Effectiveness of Soil Mulches of different kinds and different thicknesses.

	No mulch; water lost per 100 days.	Mulch 1 inch deep; water lost per 100 days.	Mulch 2 inches deep; water lost per 100 days.	Mulch 3 inches deep; water lost per 100 days.	Mulch 4 inches deep; water lost per 100 days.
Black marsh soil—					
Tons per acre	588·0	355·0	270·0	256·4	252·5
Inches of water	5·193	3·12	2·384	2·265	2·230
Per cent. saved by mulches	......	39·54	54·08	56·39	57·06
Sandy loam—					
Tons per acre	741·5	373·7	339·3	287·5	315·4
Inches of water	6·548	3·300	2·996	2·539	2·785
Per cent. saved by mulches	......	49·69	54·24	61·22	57·47
Virgin clay loam—					
Tons per acre	2,414	1,260	979·7	889·2	883·9
Inches of water	21·31	11·13	8·652	7·852	7·805
Per cent. saved by mulches	......	47·76	59·38	63·13	63·34

Where there was no mulch there was, in the case of a black marshy soil, over 5 inches evaporated away. Where the mulch was 1 inch deep, 39 per cent. was saved; only 3·12 inches of rain being lost. With a 2-inch mulch, more than half of the rain lost by evaporation when no mulch was used was saved; only 2·3 inches were lost. With a 3-inch mulch, 56 per cent.; and with a 4-inch mulch, 57 per cent. was saved.

In a sandy loam soil the results were even more striking. Without a mulch, 6½ inches of rain were evaporated. A 1-inch mulch saved nearly half of it, and that in ordinary practice might make all the difference between success and failure. A 2-inch mulch saved 54 per cent., and a 3-inch mulch 61 per cent.

In a virgin clay loam the amount evaporated was very large, 21 inches evaporating in 100 days from the surface where there was no mulch. With a 1-inch mulch, 47 per cent. was saved; with one 2 inches deep, nearly 60 per cent. of that great evaporation was saved.

I think that is fairly satisfactory evidence of the value of loose dry soil on the surface protecting the soil from evaporation.

A Practical Illustration.

The next table shows observations from actual practice. In California there were two apricot orchards growing side by side in a very dry year. It was noticed that the apricot trees in one orchard flourished exceedingly, whereas those in the other wilted and made very little growth. The only difference between the two was that the surface of one was cultivated, and the surface of the other was not. The percentages of moisture in the soil to a depth of 6 feet were determined, with the following results:—

MOISTURE in Cultivated and Uncultivated Land.

Depth in soil	Cultivated.		Uncultivated.	
	Per cent.	Tons per acre.	Per cent.	Tons per acre.
First foot	6·4	128	4·3	86
Second foot	5·8	116	4·4	88
Third foot...	6·4	128	3·9	78
Fourth foot	6·5	130	5·1	100
Fifth foot	6·7	134	3·4	68
Sixth foot...	6·0	120	4·5	90
Total for 6 feet	6·3	756	4·2	512

Where the soil had been cultivated, the percentage of moisture was 6·4 in the surface soil, with an average of 6·3 all through. Where the soil was not cultivated, the average moisture all through was 4·2 per cent. So that simply by cultivating the surface there was 50 per cent. more moisture in the soil. That made all the difference between success and failure. The two orchards were only separated by a footpath. In one the trees were a great success, made a lot of new wood, and produced abundant fruit; the other produced very stunted fruit indeed. The only difference was that one was cultivated and the other was not. The uncultivated trees made a growth of 3 inches, and the others 3 feet. The fruit of one lot was dry and shrivelled, and that of the other very good. That was all done simply by stirring the surface to maintain a mulch, especially after rain.

Fallowing.

I have mentioned fallowing. It is the great method for conserving soil moisture, though a great many people do not seem to regard it as such. Fallowing, however, has other beneficial effects, besides conserving moisture. Some fallow to rest the soil or get rid of weeds, but the most important effect of fallowing properly carried out is to conserve the soil moisture in the way I have mentioned.

Organic Matter in the Soil.

We have a means of increasing the moisture retaining power, especially of sandy soils, and that is by incorporating organic matter with the soil by ploughing in stubble, dead leaves, or farmyard manure. An interesting

experiment, carried out at Rothamsted, illustrates the great advantage of having a lot of organic matter in the soil. From 1852 till 1871 there were two plots of wheat grown side by side, one of which received no manure and the other received a dressing of stable or farmyard manure each year. Since 1871 neither crop received any manure. The result was that the average yield over a large number of years on the manured plot was three times as great as on the unmanured plot. In the year after leaving off the manure, the previously manured land still gave three times as big a crop, and that continued for several years. But the striking thing is this: that thirty years afterwards the crop on the land which had previously received the heavy dressings of farmyard manure was still twice as big as that on the land which received no manure at all—showing the importance of incorporating organic matter in the soil.

The Campbell System.

So far, I have simply been discussing the matter generally. I have not come here to-night to recommend any particular system of soil culture. But I will now proceed to describe to you what is known as "The Campbell System of Soil Culture," so greatly practised in America, to illustrate one or two points which I have been making.

First of all, I must say that great things are claimed for the system. It consists of using a cultivated fallow one year and growing a crop of wheat the next. It is claimed for this system that where the average yield of wheat is 13 bushels per acre grown year after year, by the Campbell system 50 bushels are produced every second year. A great many other things are claimed for it, but I am afraid we have to deduct a certain percentage from the statements of Campbell, on account of the country he comes from. (Laughter.) His name rather suggests the humid regions of Argyleshire than the arid districts of America; but this system is practised in America, not in Scotland. (Renewed laughter.)

The Sub-surface Packer.

The only implement used in the Campbell system that is not in the possession of the ordinary farmer is the Campbell Sub-surface Packer, shown in Fig. 8. The idea of this implement is to pack the soil underneath the surface and leave the surface loose. The picture shows what sort of an implement it is. The section hoops are rather sharp-pointed, and set at a distance of 5 or 6 inches from each other. They press down the soil. Campbell says that Fig. 9 is what the land looks like when it is ploughed. He says that it requires sub-surface packing, for this reason: There is a good deal of loose cloddy matter through which moisture cannot rise from what he calls the "subsoil." The part under the furrow slice we will call the subsoil, and that is what I mean when I am speaking of "subsoil"—

the part underneath the furrow slice. It is objectionable to make a seed-bed of this straight away, because of the difficulty of water rising from below into the seed-bed on account of these loose open spaces. "Therefore," says

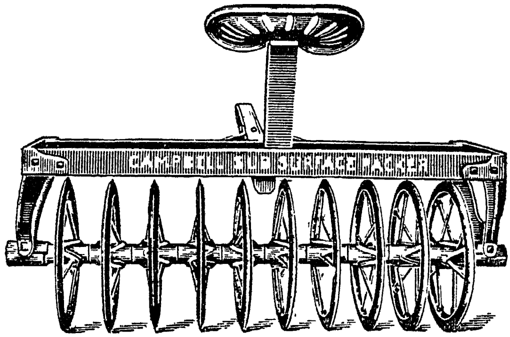


Fig. 8.—The Campbell Sub-surface Packer.
From Senator McColl's Report on Dry Farming.

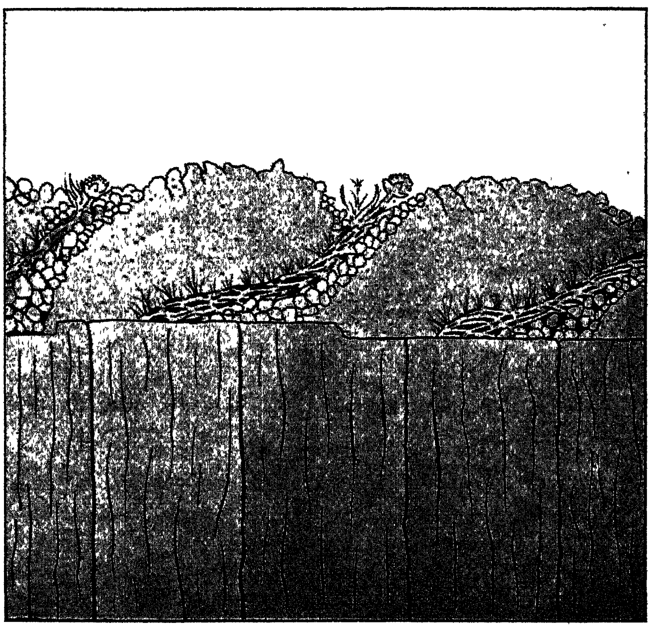


Fig. 9.—The furrow as the plough leaves it.
From Senator McColl's Report on Dry Farming.

he, "let us put the sub-surface packer over it, press these down, and reunite the furrow slice with the subsoil." That is the principle of the sub-surface packer.

Fig. 10, he says, is the result of harrowing the soil without sub-surface packing, still leaving these great open spaces through which moisture will not rise into the seed-bed. There are only small spaces where moisture can rise. This is where he is going to put his seed, and he wants the furrow slice absolutely reunited with the subsoil.

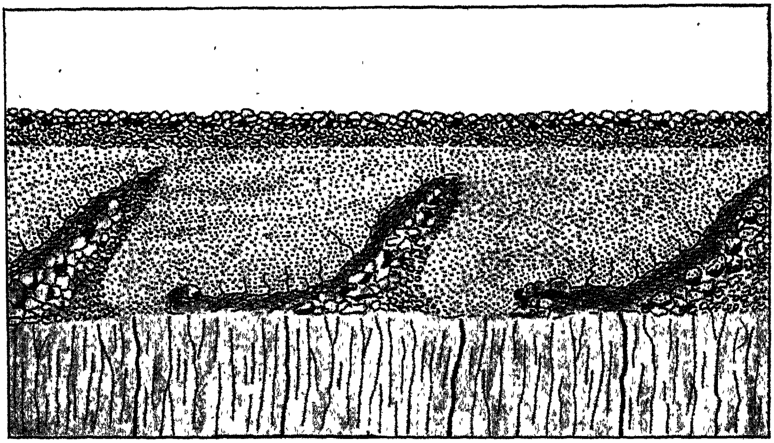


Fig. 10.—The ground harrowed, but not packed, showing the air spaces left.
From Senator McColl's Report on Dry Farming.

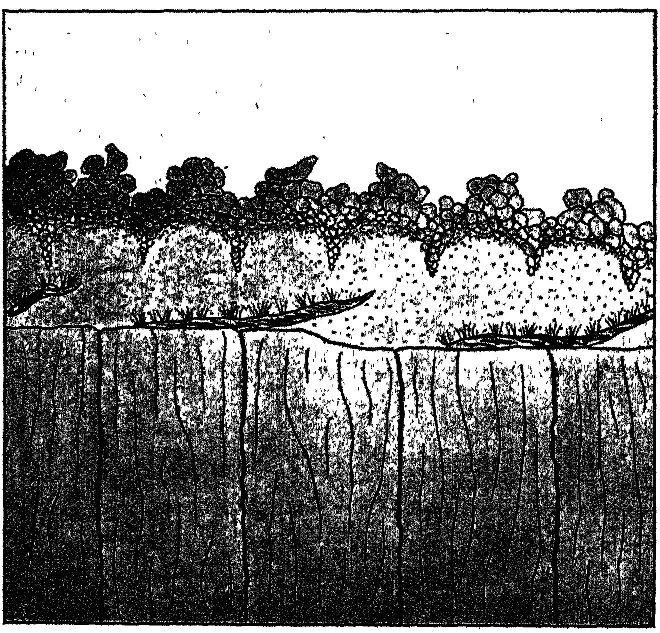


Fig. 11.—Showing soil as the packer leaves it.
From Senator McColl's Report on Dry Farming.

Fig. 11 shows the result of using the sub-surface packer. He is quite right in what he aims at. When one sows seed one wants a subsoil containing moisture; secondly, the sub-surface—the real seed-bed—to be worked finely and pressed fairly tightly, so that there will be no difficulty in the moisture rising from the subsoil into the sub-surface; and lastly, the surface soil loose to form a mulch. After harrowing, this makes almost ideal conditions for a seed-bed. (Fig. 12.)

Of course, it is easy enough to put this on a lantern slide; but I do not care how you get results like this; if you get something like these conditions, you will not be very far wrong. If you get in your subsoil a store of moisture, and your sub-surface finely worked and fairly tightly pressed, with a loose mulch of dry crumbs on the surface, you have ideal conditions for sowing.

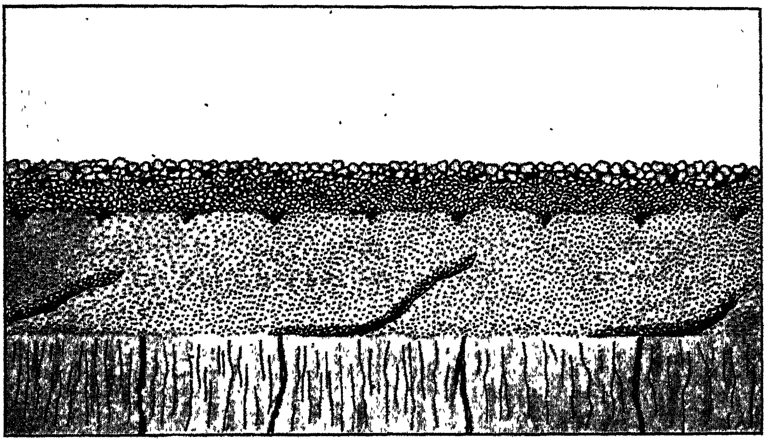


Fig. 12.—Showing soil after packing and harrowing.
From Senator McColl's Report on Dry Farming.

The System Explained.

What is the Campbell system? As I said, for very arid conditions, he recommends fallowing one year, with the idea of conserving the moisture, and growing his crop of wheat next year. He is to take two years' rainfall for the growth of one crop of wheat.

Immediately the crop is off, he gets on to the land with a disc implement, so as to break up the surface and form a mulch, to catch any rains that may fall. In this country that would be December or January. He harrows that occasionally after rains, and does not touch it again until early spring, perhaps September here. Then he discs it again to destroy the weeds. After that he harrows after every heavy rain until it comes around to the equivalent of February, when he ploughs the soil to a depth of 7 inches, with the result that the soil which had been on the top is now his seed-bed, and the more or less raw soil from below is to form his soil mulch.

Then he puts in his seed by means of a shoe drill, and he harrows the crop occasionally until it is about 6 inches high. That, briefly, is the Campbell system of soil culture.

Fig. 13 shows us a contrast. These are not actual photographs, but simply drawings made to illustrate the Campbell system. Undoubtedly he has ideal conditions on the left. Campbell system or no Campbell system, this is what we want, except that the drawing is slightly incorrect. The shoe drill makes a sort of triangular hollow, into which it deposits the seed, so that it is surrounded below and at the sides by fairly compressed moist soil, and it

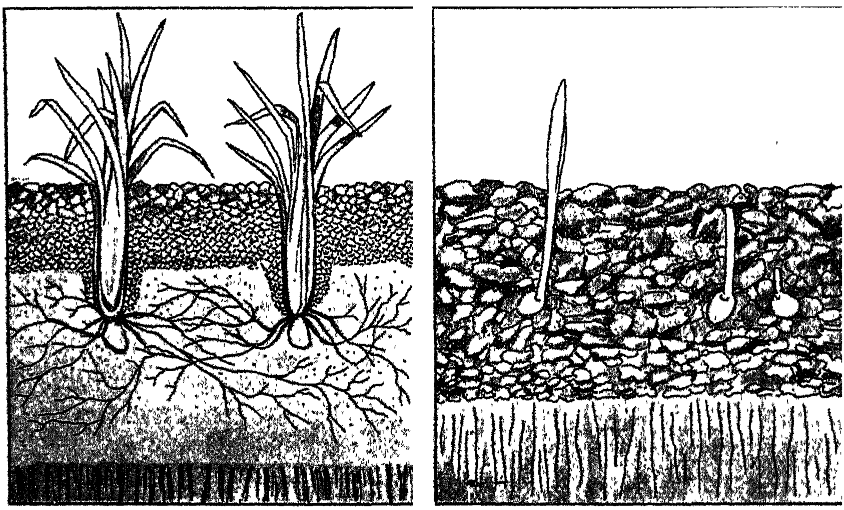


Fig. 13.—Germination of wheat, showing the difference between firm soil and loose open soil.
From Senator McColl's Report on Dry Farming.

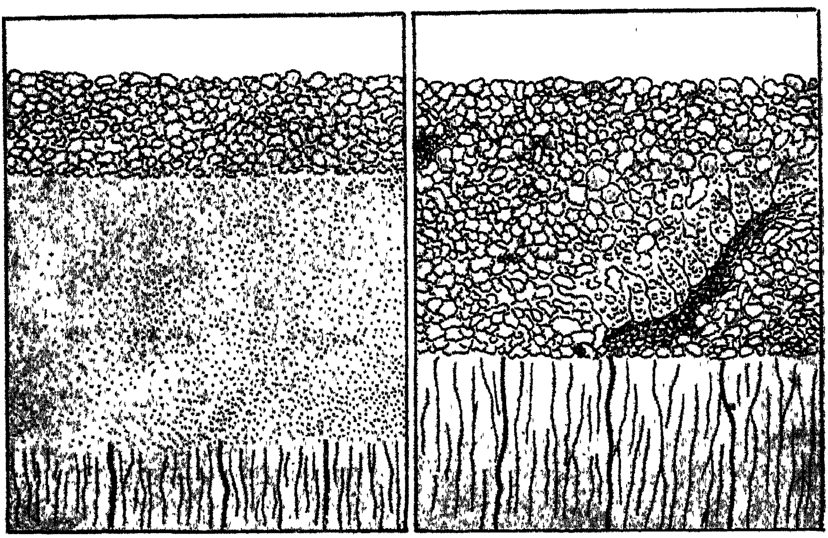
germinates freely in this carefully preserved seed-bed. It is protected from evaporation by the winds by the mulch, and any amount of moisture can rise from below.

The picture on the right shows the way he says the ordinary farmer puts in his seed. I think it is a caricature. These are not ideal conditions. The seed is put in loose soil, with no access to the moisture in the soil below, and it will not germinate until rain falls. If rain does come, it starts to germinate, and then, if dry weather succeeds, it dies off. This has happened this year in a great many cases, but not under conditions quite as bad as that.

Campbell calls his summer fallow "Summer culture." He gives a picture like Fig. 14 to show it; but it simply means, from his description, the double discing and harrowing after every rain. It is only when he prepares his seed-bed that he has his soil in condition like this.

This is the last slide, and brings my lecture to a close. I am afraid I have wearied you by going into too many technicalities.

In conclusion, I would like to say that by putting into practice the principles which I have just described—together with the correlated principles with regard to the conservation of fertility; with a pushing forward of the work of wheat-breeding and eradication of plant diseases; with continuous progress in our educational system, agricultural and otherwise; with a wise policy of closer settlement and liberal immigration schemes; with a bold policy of railway development in keeping with the potential resources of this country—I have no hesitation in saying that New South Wales in the future will be a great land, a land of wheat and fruit, a land of corn and



Summer Culture as applied by the Campbell method. Summer Fallow as commonly applied.

Fig. 14.—Summer Culture *versus* Summer Fallow.
From Senator McColl's Report on Dry Farming.

wine, a land of flocks and herds, a land flowing with milk and honey, carrying on its fertile area millions of contented and prosperous people. Then the words "drought" and "rabbits" will have lost most of their meaning; then we need have no fear of attack from enemies without; for the wish of the songster of my native county for Scotland shall indeed be fulfilled for Australia:—

> "A virtuous populace shall rise the while,
> And stand a wall of fire about our much-loved isle."

ANSWERS TO CORRESPONDENTS.

MR. F. L. NEILL, of Geurie, has made a suggestion that a "Questions and Answers" page be inserted in the *Gazette*, in order that information supplied in answer to questions on matters of general interest may be made widely known. The practice has been that letters addressed to the Editor asking for expert advice are treated as official communications to the Department, and are answered by letter from the Under Secretary as quickly as possible. The Department's correspondence amounts to about 30,000 letters per annum. From time to time, when the matter appears to be of wide general interest, a note is made in the *Gazette*; but the question of space limits the extent to which this can be done.

The Department recognises the value of Mr. Neill's suggestion, and the practice of inserting notes on questions of general interest raised by correspondents will be extended as far as reasonably possible: whilst at the same time correspondents will receive direct answers from the Department, which will reach them more quickly. Of course no correspondent's name will be published unless it is quite clear that he has no objection to such being done.

SAMPLES OF NEW SOUTH WALES WHEATS IN ENGLAND.

IN our September, 1910, issue, page 809, reference was made to some of the prize-winning samples of wheat at the last Royal Agricultural Society's Show, which were purchased and sent to the Agent-General for exhibition in England.

Mr. Coghlan has since written to the Premier to the effect that experts at Liverpool judged the grain to be of prime quality, and many of the millers expressed the belief that if Australian growers would make a special feature of such varieties as Bobs, Jade, and Bunyip, a considerable improvement would be immediately noticeable in the price obtained for the wheat purchased in Great Britain. The variety Medeah was lighter than the others, and the opinion was expressed that the price realised per bushel would be considerably lower.

Mr. Vernon, Vice-President of the Liverpool Corn Trade Association, and one of the leading millers in England, urges, in the interests of New South Wales growers, that two standards be adopted, as a large quantity of prime wheat is sold which is superior to the F.A.Q. Standard.

On the whole, Mr. Coghlan regards this display as a pronounced success.

KILLING GREEN TIMBER.

MR. J. E. M. GILMOUR, of Gilgandra, has been using the well-known scrub exterminator, arsenite of soda, for the destruction of green timber, apparently with excellent results. He has described his method as follows, in the *Sydney Morning Herald*:—

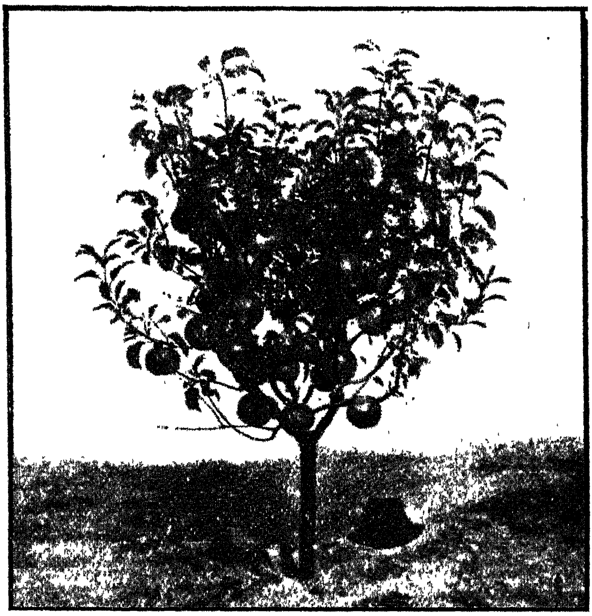
The strength of the mixture is 7 lb. of washing soda and 3½ lb. of arsenic, in 4 gallons of water. The plan I adopt is this :—Put a kerosene tin nearly full of water on to boil, and add 7 lb. soda and 3½ lb. arsenic. Stir it while boiling for a quarter of an hour, then let it simmer for an hour or two, stirring occasionally until everything is dissolved. Keep away from the fumes. Then fill the tin up with cold water, and use the mixture, hot or cold, being careful not to let it under finger-nails or into cuts, as it is a blood as well as a stomach poison. Ringbark the timber with an overlapping frill cut in the ordinary way, and pour the liquid in with an old tea-pot, wetting it all round —say, one-third of a cup for a large tree. Any small stuff is cut off with a straight or shaped cut as near to the ground as convenient, and the liquid is poured on to the stump very steadily. Wait a moment to let it soak in, then drip a little more on. The first application turns the sapling sap pink, and then a deadly dark colour, and completely kills the tree within a few weeks, roots and all. Where the trees have been ringbarked and have grown suckers, either ringbark the stump where practicable or cut off the suckers and steadily apply the liquid. Where the work has been slummed the trees either take months to die or they die down and sprout out again. I find soft, sappy, vigorous gum and box suckers, etc., take the liquid best, and die straight away ; but the oak, belar, budtha, etc., being more brittle and not so porous, are more difficult to get the liquid into. The liquid wants applying while the cut is fresh. Two men with axes and one following with the liquid work best, letting the axeman give the other a hand with another tea-pot, as occasion demands. Under these conditions, 2s. a day covers the cost of the liquid. I have used upwards of half a ton of soda and arsenic on about 300 acres of very dense timber, mostly suckers, and as the rainfall in this district is about 24 inches, the growth is very rapid. Some people think this will injure the soil, but I noticed the grass grow beautifully right up to the stumps of some saplings that were done early in the year. Buying the washing soda by the 2-cwt. cask costs less than 1d. per lb , and the arsenic in 5-gallon oil drums costs under 3d. per lb. On digging round one large box tree in the ordinary way, and firing it seven weeks after it had been treated, I found the roots were quite dry, and it burnt up splendidly. . . . I think it desirable to use some kind of gloves to protect the hands. The question is, what material will stand the soda. One final word of advice to those about to try the above method—do it thoroughly.

Mr. Gilmour informs us that a good many saplings and suckers that were treated last, when the ground was very dry, are shooting again, but rather sickly. At the same time he thinks the work was slummed a bit. The axe-work must be done thoroughly, and reasonably near the ground, and the liquid must be put on steadily, giving it time to soak in.

Mr. F. B. Guthrie, Chemist of this Department, points out that the half-ton of soda and arsenic made in the proportions given above would contain 343 lb. (3 cwt.) of arsenic. As this is considered enough for 300 acres, it only means 1 lb. arsenic to the acre, which is not likely to be injurious, even allowing for the fact that it is not evenly applied. If a certain time (say three or four weeks) were allowed before stock were permitted on the land, he considers there would be no danger of poisoning. Mr. Gilmour states that he had a large number of sheep in one small paddock *immediately* after the treatment, and also a lot of horses while doing the work, with no injurious results. While the spray may be dangerous to stock, he considers the tea-pot safe enough.

A Promising Young Apple Tree.

Mr. H. S. Wark, of Bathurst, supplied the accompanying photograph of one of his three-year-old Rome Beauty trees some time ago. It will be seen that the fruit is fairly thick on the main limbs, and very large. The quality and flavour of the apples themselves are, in Mr. Wark's judgment, absolutely perfect. He states that he had nearly 100 cases last year, and, taken right through, including culls, they averaged over 8s. per case. He gained a number of important prizes in Sydney and Bathurst with his fruit, and is kind enough to say that this result is largely due to the advice of the Department.



Three-year-old Rome Beauty Apple.

Re-queening as a Factor in Profitable Bee-keeping.

Mr. W. B. Bray, Bee Instructor, gives, in the New Zealand *Journal of the Department of Agriculture*, tabulated information obtained by circularising the larger bee-keepers of the Dominion on this subject. The average return per hive of honey received by those who have practised a thorough system of re-queening from the best stock for the last five seasons was 81·0 lb.; those who practised a partial system of re-queening received an average of 59·7 lb.; whilst those who left their bees alone altogether received 53·0 lb. of honey per hive per season.

For the season 1909-10, Italian bees averaged 83·9 lb., and black bees 66·1 lb. Bee-keepers in the Dominion who have used Italians have, almost without exception, found them preferable to the blacks.

Soils of New South Wales.

Part III.—The South Coast and North Compared.

H. I. JENSEN, D.Sc., Chemist's Branch.

The analyses published in my previous paper on the South Coast Soils (*Gazette*, February, 1910), were all analyses of typical soils, collected and analysed by myself. It was thought desirable to examine all the past analyses conducted by the other officers of the Department, classify them as well as possible according to geological formation, and average the composition of each class for comparison with type soils.

Accordingly, all the South Coast soils in the first 2,163 soils analysed by the laboratory staff, amounting to 129 in all, were averaged and classified. The averages thus obtained should be very representative of the type soils of the region, since the samples submitted were sent in for different reasons, and although it might be expected that a preponderating number were taken from alluvial flats intended for cultivation, they usually were submitted because of some deficiency experienced. In the average, errors arising from a faulty method of collecting are probably almost wholly eliminated. The error arising from incorrect description of the geological formation on which the sample is taken is probably of greater consequence, but I have taken care not to include in the geological groups any soils assigned to a formation which is unknown in the locality from which it comes. Possibly many of the soils assigned to each formation are of a mixed origin. This would tend to make the average of the sandstone and granite soils rather better than it ought to be, and the average of the soils derived from basic rocks rather poorer. In spite of these defects, the averages are useful for comparative purposes.

The 294 North Coast soils, exclusive of type soils analysed by myself, in the first 2,500 soils analysed by the laboratory staff, have been similarly classified. The Hastings, Manning and Macleay district has been included with the Northern Rivers in the total for the North Coast, but has been considered separately in the geological classification.

It is the writer's intention to classify all the analyses of New South Wales soils made by the Department into meteorological and geological groupings, so that the influence of climate and rock formation on the soil may be studied.

Table I gives the average composition of all the South Coast and North Coast soils, and for comparison, Mr. Guthrie's average of the composition of all the County Cumberland soils is inserted.

TABLE IIA.—Average Composition of South Coast Soils, analysed by the Branch, and geologically grouped.

Formation.	Colour.	Water Capacity.	Capillarity.	Clay.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Remarks.
		per cent (approx.)	inches (approx.)	per cent. (approx.)	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
(*a*) Total (129)	......	....	... ..	.. ..	5 18	10 36	·231	·217	·086	·125	
(*b*) South Coast sandstone, ranges and tablelands (5)	Light ..	50	7	40	2·34	6·26	·188	·054	·047	095	The highland sandstones are all of a very siliceous type.
(*c*) South Coast sandstone, lowlands (35).	Light ..	45	8	35	3·47	8·93	·207	·100	·078	019	This series includes analyses of the Illawarra calcareous sandstones and mudstones.
(*d*) Alluvials (3)	Dark ..	48	5	62½	4·73	9·50	·227	·302	·201	·169	
(*e*) Schists and slates (5).. ..	Grey ..	35	5	25	2·16	6·26	079	·089	·102	072	
(*f*) Granites (18)	Light ..	33	9	35	2·49	6·57	·151	·182	·102	·083	
(*g*) Basaltic ranges (8)	Dark ..	... ..	... ..	. ....	......	17 91	·395	·119	·109	·288	Low percentages of lime to be expected; due to leaching.
(*h*) Basaltic lowlands (12) ..	Dark ..	60	9	50	8·25	18·41	·418	·264	·074	·218	

TABLE IIB.—Average Composition of South Coast Type Soils geologically grouped.

Formation.	Colour.	Water Capacity.	Capillarity.	Clay.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Remarks.
		per cent. (approx.)	inches. (approx.)	per cent. (approx.)	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
(*a*) Poor sandstone soils, Nowra district.	Light ..	30	6	35	3·31	4·37	·079	·044	·038	·039	Compare Table IIA (*b*). The good sandstone soils included in (*c*) Table IIA considerably raise the averages.
(*b*) Type soil; sandstone; turpentine ranges.	Light ..	39	4	53	3·70	6·42	·147	·055	·057	·036	
(*c*) Type alluvial, Shoalhaven flats .	Dark ..	40	7	72	3·84	8·82	·294	·355	·110	·189	Compare (*d*) Table IIA.
(*d*) Soils of schistose ridges.. ..	Grey .	30	6	35	1·89	6·97	175	088	·142	·040	,, (*e*) ,,
(*e*) Soils of basalt origin	Dark .	... .	......	. ....	......	......	337	·326	·121	·218	,, (*h*) ,,
(*f*) Average of nine granite soils ..	......	35	8	35	......	6 79	·156	·257	·146	·055	Two dark granitic soils from Buckembowra make the average abnormally high.
(*g*) Same soils as (*f*); two from Buckembowra omitted.	Light ..	35	8	35	......	6·15	·142	·176	·075	·039	Of normal acid granite origin; bone-chewing soils.
(*h*) Nine bone-chewing granite soils	Light ..	35	8	35	......	5·55	·149	·146	069	·053	
(*i*) Six unaffected soils; granite ..	Dark ..	35	9	35	......	7·90	·266	529	·253	·115	From more basic granites allied to granodiorite; unaffected with bone-chewing.
(*j*) Two Buckembowra soils; granite	Dark ..	39	6	14	2·32	9·05	·252	·538	·391	·113	

TABLE I.

District.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
129 South Coast soils ...	5·18	10·36	·086	·231	·217	·125
294 North Coast soils ...	6·29	13 18	·086	·256	·173	·178
Over 130 County Cumberland soils	......	Shale ... 7·62 Sandstone 7·22	·099	·136	·121	·116

From this Table it will be observed that the North and South Coast soils are, on the average, much better than the County Cumberland soils, as we should expect from a consideration of the siliceous nature of the rocks of the County of Cumberland.

The differences between the North and South Coast soils are most readily explicable on meteorological grounds. The North Coast has the much higher rainfall; so that, other things being equal, a richer vegetation is produced, and is further favoured by the warmth of the district. More organic matter is, therefore, incorporated in the North Coast soils than in those of the South Coast, and, consequently, the moisture content (and water-retaining power) of the former is the better. The presence of abundant decaying vegetation produces organic acids and carbon-dioxide, by means of which the lime percentage is reduced in the Northern Rivers soils, the higher rainfall being also favourable to the leaching. All the soils considered in the compilation of Table I are acid, those from the northern districts naturally most so. The high acidity of these last favours rapid rock disintegration, and ensures an abundant supply of mineral plant-food in an easily available condition. Therefore, the North Coast is a much richer district than the South Coast, and will remain so until, by grazing and cultivation, the humus percentage in the soil is so reduced that the transformation of plant-food from the unavailable to the available form becomes too slow.

Table IIA gives the average composition of all the soils on each geological formation in the South Coast district, and Table IIB the average composition of type soils for comparison. Tables IIIA and IIIB deal with the North Coast soils in the same way.

The facts already noted in the discussion on Table I are again in evidence. The North Coast soils are all relatively richer in organic matter, and poorer in mineral plant-food soluble on digestion in concentrated hydrochloric acid. They are more leached. Leaching is particularly in evidence in the basaltic soils such as those from Dorrigo, in which the lime is very much below the figure which we are used to expect in such productive soils. This fact does not, as far as present field evidence goes, diminish the fertility of the northern basalt soils. We may lay down, as a rule for both the northern and southern districts, that the soils depend in quality on their geological formation, and diminish in productivity in the following order: (1) alluvial, (2) basalt, (3) diorite and basic (hornblendic) granite, (4) shale and mudstone, (5) phyllite, schist, and slate, (6) acid (siliceous) granite, (7) sandstone.

TABLE IIIA.—Average Composition of North Coast Soils, analysed by the Branch, and geologically grouped.

Formation.	Colour.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Remarks.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	
(a) Average of all North Coast soils (294) ..	......	6 29	13·18	256	·173	·086	·178	....
(b) Grafton Sandstone series (24)	Light	2 71	7 01	·124	·085	·062	·114	....
(c) Northern Rivers alluvials (15)	Dark	5 92	12·52	·331	·335	·161	·220	....
(d) Manning-Hastings-Macleay alluvials (15)	Dark	8·20	15·59	·293	316	·037	·174	....
(e) Northern Rivers metamorphic (17) .	Medium ..	4·46	10·32	·189	·126	·068	·223	....
(f) Manning—Hastings—Macleay metamorphic (16)	Medium ..	4·66	10·22	·223	·141	081	·175	....
(g) Manning—Hastings—Macleay Carboniferous rocks (56)	Dark and light	6·66	12·18	·255	·143	·085	·149	This series includes sandstones, shales, andesites, and rhyolites.
(h) Manning—Hastings—Macleay basic rocks (16)	Dark and red..	7·17	11·48	·265	·318	122	·179	....
(i) Northern Rivers basalts (including Dorrigo) (68)	Dark	6 56	15 07	·249	·167	·087	·199	....
Same, without Dorrigo (36)..	Dark	5·84	13·20	·222	·168	·073	·226	....
(k) Red, chocolate, and brown soils from Dorrigo (22)	......	6·73	17·92	·286	·179*	·098	·175	....
(l) Yellow and grey soils from Dorrigo (10) ..	......	8·76	15·55	272	040	·119	.152	....

* Four marly soils, containing over ·500 per cent. of lime, account for the high figure. Omitting these four, the average of 18 red, brown, and chocolate Dorrigo soils, contains ·042 per cent. of lime.

TABLE IIIB.—Average of North Coast Type Soils.

Formation.	Colour.	Water capacity.	Capillarity.	Clay.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
				per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Alluvial—Manning-Macleay area	Dark .	Low to high	Good ..	70 (Heavy loam.)	4·77	10·13	·258	·442	·158	·152
,, —Northern Rivers	Dark ..	Very good	Good ...	Over 70 (Clay.)	2·88	9 75	·241	·291	·153	·154
Sandstone—Manning-Macleay area	Light .	Low ..	Fair ..	47 (Loam.)	1·81	5·34	·119	·130	·112	·077
,, —Clarence Beds	Light ..	Low ..	Very good	About 20 (Light loam.)	0·64	3·70	·103	·060	·063	·055
Slate Soils—Northern Rivers	Light ..	Good ..	Good ..	Over 70 (Clay.)	4·22	11·02	·274	·149	·092	·094
Volcanic Soils—Manning-Macleay*	....	....	....	. ..	....	....	. ..	....	....	....
,, —Northern Rivers* ..	....	....	....	....	....	...	....	....	....	....

* Average not taken, since chemical differences are very great between leached and unleached types.

To study the influence of geological formation and climate on soils, we will deal separately with each of the following groups:—(*a*) Sandstone soils, (*b*) Granite soils, (*c*) Alluvial soils, and (*d*) Basalt soils. These are, therefore, compared in Tables IV, V, VI, and VII. Since no appreciable difference in the mechanical condition occurs between soils of similar origin in different climatic regions, it is quite unnecessary to recapitulate the mechanical analysis. It suffices to say that both in the north and in the south the typical sandstone soil is a sandy loam (clay, usually less than 40 per cent.), with high capillary power and low water capacity. The granite soils are everywhere typically loams with good capillary power and low or only fair water capacity. The basalt and alluvial soils are typically heavy loams, sometimes clays, with fair capillary power and high water capacity.

TABLE IV.—Composition of Sandstone Soils.

District.*	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
FARMERS' SOILS.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
South Coast Highlands (5) ...	2·34	6·26	·188	·054	·047	·095
South Coast Lowlands (35) ..	3·47	8·93	·207	·100	·078	·109
Hawkesbury Sandstone ...	......	7·22	·133	·106	·066	·137
Grafton—Clarence Beds (24) ...	2·71	7·01	·124	·085	·062	·114
TYPE SOILS.						
South Coast Highlands, Turpentine Range.	3·70	6·42	·147	·055	·057	·036
South Coast Lowlands, Nowra Grits and Siliceous Sandstones.	3·31	4·37	·079	·044	·038	·039
Clarence River Sandstones ...	64	3·70	·103	·060	·063	·055
Raymond Terrace Sandstone Soils (9).	1·12	4·66	096	046	·023	·028

* The term "South Coast Highlands" is used to embrace the mountain parts, such as the Cambewarra Ranges, Sassafras, Turpentine Range, and so on. The "South Coast Lowlands" is the coastal belt below 1,000 feet in altitude, east of the ranges.]

It is easily observed from this Table that sandstone soils are universally poor in plant-food. The figures for the South Coast Lowlands and Hawkesbury Sandstone (farmers' soils) are high, because it is inevitable that many soils of semi-alluvial or mixed origin have been included. The extreme poverty of the South Coast Highland sandstone soils and of those of the Nowra grits is the result of the siliceous character of the geological formation (quartz sandstone). The Grafton sandstone soils are somewhat better, because beds of felspathic sandstone occur in this series, but if in the average of the type soils from this district we omit those from semi-alluvial and felspathic sandstone origin, the result compares well with the figures for the South Coast. The good sandstone soils from the Illawarra district have been omitted from the Table, because the rock formations to which they belong are not typical sandstones but calcareous and felspathic sandstones, mudstones, and shales

We also see that the type soils of each formation give an average very near that of the farmers' soils of the same formation in the same district. All the tables lead to the conclusion that the average of very many soils belonging to one formation is nearly the composition of the type soil.

TABLE V.—Granite Soils.

District.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
FARMERS' SOILS.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
South Coast (18)..	2·49	6·57	·151	·182	·102	·083
New England (18)	1·87	4·57	·104	·211	·159	·104
TYPE SOILS.						
South Coast soils (9)	......	6·79	·156	·257	·146	·055
Same, omitting Buckembowra (7).	......	6·15	·142	·176	·075	·039
Buckembowra soils (2)	·232	9·05	·252	·538	·391	·113
BONE-CHEWING.						
Soils from unaffected areas (6)...	......	7·90	·266	·529	·253	·115
Soils from affected areas (9) ..	......	5·55	·149	·146	·069	·053
Five typical New England soils, blue granite, Tenterfield.	1·42	4·86	·070	·223	·184	·058

This Table brings out strongly the fact that great variation may exist in the quality of granite soil. The prime factor in producing this variation is the mineral composition of the rock. Granites rich in lime-felspar and hornblende yield good soils, as in the case of the Buckembowra and "unaffected" areas. Granites of a very siliceous nature and poor in dark constituents and lime felspar, yield very poor soils, as with the areas affected with bone-chewing. The bone-chewing soils do not differ greatly in mineral plant-food from the South Coast farmers' soils, and from the type soils, omitting Buckembowra. Indeed, all that can be said of them is, that continued grazing for a long term of years has sickened them, and all poor granite and sandstone soils are apt to deteriorate in the same way if grazed for a great period; those soils which are extremely poor seem to carry the disease without prolonged grazing.

The New England granite soils (inserted for comparison) are relatively richer in mineral plant-food than those of the South Coast, but poorer in organic matter and nitrogen. This is a natural consequence of the more inland climate.

In granite soils the phosphoric acid is generally present in fair or satisfactory amount, but the proportion of lime and potash cannot be called good, except in soils derived from basic granites. It is but rarely that either of these ingredients is actually bad in amount, as is the case in many sandstone soils.

TABLE VI.—Alluvial Soils.

District.	Moisture	Volatile	Nitrogen.	Lime	Potash.	Phosphoric Acid.
FARMERS' SOILS.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
South Coast (3)	4·73	9·50	·227	·302	201	·169
North Coast Rivers (15) ...	5·92	12·52	·331	335	·161	·220
Manning - Hastings - Macleay (15).	8·20	15·59	·293	316	·087	·174
TYPE SOILS.						
Shoalhaven (1)	3·84	8·82	·294	·355	·110	·189
Manning–Macleay (5)	4·77	10·13	·258	·442	·158	·152
Northern Rivers...	2·88	·975	·241	·291	·153	·154

As might be expected, the alluvial soils of different parts of the State show fewer differences between one another. Their position and their uniform mechanical constitution cause the forces of leaching to act similarly on all, and only in a minor degree. The alluvial soils of the northern district contain a much higher percentage of organic matter than the southern alluvials: this is the effect of climatic conditions, which produce a rapid and rank growth in sub-tropical regions. Again, the South Coast alluvials show better in potash, which comes from geological considerations, granite rocks being predominant. The soils of the Manning, Hastings, and Macleay are derived mainly from sandstones, shales, slates, and andesites, rocks rich in other silicates than those of potash.

TABLE VII.—Basalt Soils.

Locality and Type.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.
FARMERS' SOILS.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
South Coast Highlands (8) ...		17·91	·395	·119	·109	·288
South Coast Lowlands (12) ...	8·25	18·44	·418	·264	·074	·218
North Coast (68) (including Dorrigo).	6·56	15·07	·249	·167	·087	·199
TYPE SOILS.						
South Coast Highlands—Sassafras (1).	7·00	8·96	·126	·088	·037	·091
South Coast Lowlands (6) ...	......	......	·337	·326	·121	·218
North Coast Ranges (1) (Tweed River).	8·40	18·99	·392	·162	·029	·102
NORTH COAST SPECIAL. *Dorrigo Soils.*						
Red, brown, and chocolate (22)	6·73	17·92	·286	·179*	·198	·175
Yellow, grey	8·76	15·55	·272	·040	·119	·152
North Coast, without Dorrigo...	5·84	13·20	·222	·168	·073	·226

* Omitting four specially lime-rich soils, the figure for lime is only ·042 per cent.

Table VII is more interesting. Basaltic soils are, according to experience, usually very productive. On flat country where the rainfall is fair to

moderate, basalt soils are also chemically rich in manurial ingredients, as was remarked in my first article of this series (February, 1910). But in the case of basalt soils from ranges, tablelands, and hills, especially in a warm moist climate, leaching is such an active agency that, chemically, the soil appears to be very poor in spite of its fertility. This fact is well instanced by the analyses of the Sassafras soil (South Coast Highlands) and the Tweed soil (North Coast ranges), both red soils, very strongly acid and very productive. The former produces year after year some of the best potatoes of the State, and the latter is capable of growing that most exhausting crop, sugarcane, year after year, without manure. A sandstone or granite soil as poor as these in lime and potash would greatly benefit by manuring. Whether the basalt soils of such composition will respond to manuring I do not know, but I should hardly think so, as the agencies which have reduced the chemical richness of the soil will also rapidly leach out the added manure; and, further, it is probable that there is an abundance of water-soluble mineral plant food in a readily available condition in the water of these soils, more than sufficient for the needs of plants, and this supply is kept up by rapid rock decomposition, speeded by the corrosive action of organic acids. There is no doubt that basaltic rocks weather rapidly under the conditions here described. It is also known that basalts invariably have a good percentage of lime, far more, often a hundred times more, than granites and sandstones. Where does this lime go? Evidently it must be leached away in the acid soil water. The basalt soils which are weak in lime are invariably very rich in organic matter. It is, therefore, clearly the organic matter which acts as a destroyer of the lime by generating organic acids and carbon dioxide.

These facts show clearly that, in order to correctly interpret a soil analysis we must know the position of the soil, whether it was taken on a hill slope, a flat, or a tableland; we must know the geological formation, whether the underlying rocks are easily eroded and corroded or not, whether organic acid attacks their constituents rapidly or not; and we must know the climate of the district. Further, the position, geological formation, and climatic conditions of the soil being known, it should be possible for an experienced man to say as much, if not more, by mere inspection of the soil, than by judging the results of its analysis. For example, if a soil comes from a region where through heavy rainfall and peculiarity of position leaching is rapid, is it wise and economical to add very soluble fertilisers? Would it not be just as efficacious and more economical to add fertilisers which disintegrate slowly, as, for example, limestone instead of slacked lime, bonedust instead of superphosphate, crushed potash-felspar instead of soluble potash salts? If the rock formation underlying such a leached soil is, as at Sassafras, Tweed Heads or Dorrigo, a basalt containing a sufficiency of potash, lime, and phosphoric acid, is it not probable that the only condition essential to maintaining soil fertility is the continual incorporation of sufficient acid forming organic matter in the soil to allow rock decomposition to progress at the same pace as in the natural state? Burning off the stubble in the northern maize fields may indeed be a very wasteful time-economy.

The strong natural acidity of these soils does not constitute sourness in the sense in which the settlers use the term. While sourness due to lack of aeration is accompanied by strong acidity in stagnant swampy lands, acidity does not necessarily mean lack of aeration, and where it is not accompanied by lack of aeration it is a valuable property, ensuring decomposition of the mineral constituents of the soil, and a strong bacterial flora.

The facts evidenced in these tables also emphasise the point that every farmer who has soils analysed should use a considerable amount of judgment in his acceptance of the recommendations. As the reply forms sent to farmers by this Department instruct, each "Report is intended to be merely suggestive, and must be followed up by careful experiments on your own part. You should communicate regularly with the Department as to the results of your experiments."

BINDING THE "AGRICULTURAL GAZETTE."

WITH this issue our readers will receive a copy of the Index to the 1910 Volume of the *Gazette*. A suggestion has been made that a bookbinder be asked to quote a price for binding the volume for the year, and the quotation published for the information of those who may desire to preserve the parts in permanent form.

Each of the following firms has offered to bind the twelve monthly *Gazettes* and Index into one volume, full cloth, and lettered on the back, "The Agricultural Gazette of New South Wales; Vol. XXI, 1910," for the sum of 6s. Readers who have kept the parts and wish to take advantage of the quotation may communicate with one of the firms :—

Wm. Brooks & Co., Ltd., 17, Castlereagh-street, Sydney
John Sands, Ltd., 374, George-street, Sydney;
W. E. Smith, Ltd., Bridge-street, Sydney.

Insectivorous Birds of New South Wales.

[Continued from Volume XXI, page 1027.]

11. The Willie Wagtail.

THE largest of Australian birds is the Emu, and this has been selected for the national coat of arms; but if a plebiscite were taken to find the most universally loved of our native birds, we venture the opinion that the people's choice would lie between the Laughing Jackass, the Magpie, and the Willie Wagtail—the jackass, whose loud, fearless laugh rings through the forest to the echo of the settler's axe; the magpie, which warbles its crude, sweet song in the paddocks at daybreak; or the Willie Wagtail (the "Shepherd's Companion"), the restless little black and white songster known and loved throughout the whole of the Commonwealth. All three are insectivorous; and whilst it may be unnecessary to advocate the protection of birds which few indeed would destroy, some short notes on the Wagtail, particularly his feeding habits, may be of interest to those who regard the bird as an object of beauty alone.

The Willie Wagtails may often be seen dancing upon the backs of horses, cattle, or sheep grazing in open paddocks, or hopping along in the grass before them. They are either searching for parasites upon the animals, or catching the insects disturbed by them while feeding, principally flies, small moths, and beetles.

Mr. North thus describes the Wagtail's method of feeding:—

> Like all the fly-catchers, this bird has the habit of watching the insects flying around it while perched on a limb of a tree, or top of a post or fence. Suddenly it darts into the air, and with a vicious little snap secures its prey, returning again to the same place to pull it to pieces and eat it. Mr. Frank Hislop informs me that he has frequently seen this species feasting on ticks infesting cattle, in the Bloomfield River District, North-eastern Queensland. So tame do these birds become, if unmolested about country houses, that they will feed out of their protector's hands.

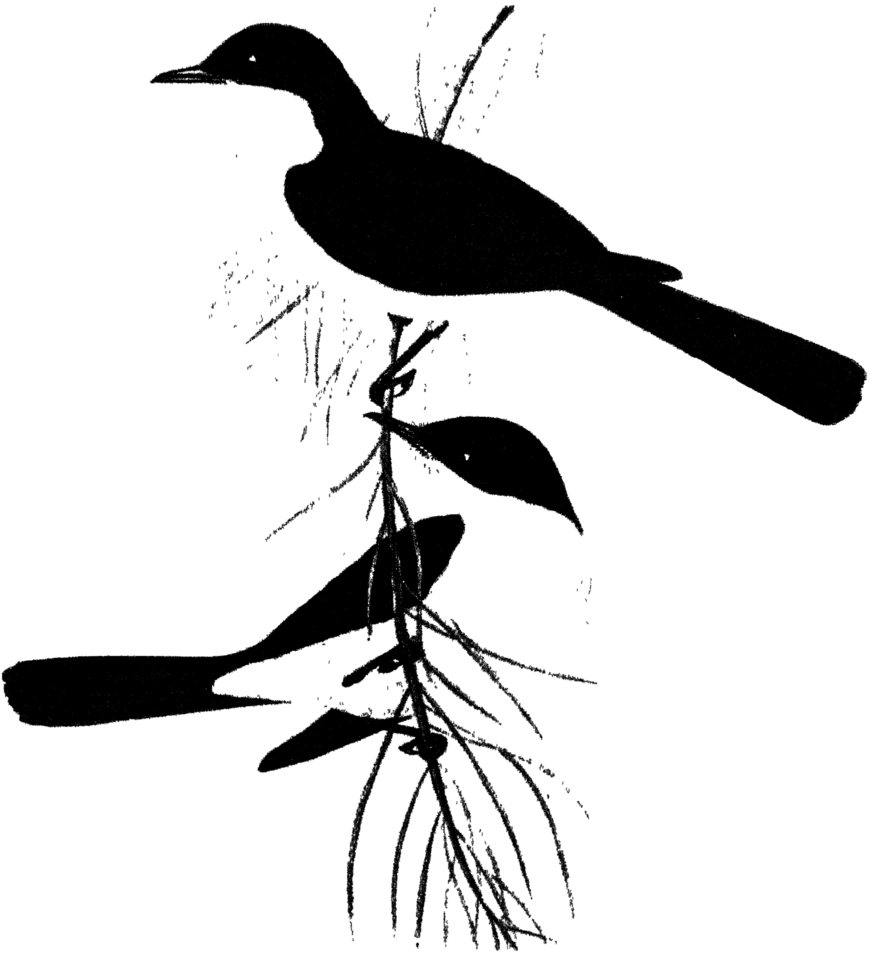
In fact, the familiarity of the bird is one of the reasons for its popularity. In the central-western districts it is regarded as almost part of the home, and one would no more interfere with the Willie Wagtail than destroy the domestic chickens, its daily companions. "Sweet pretty creature," the cry of the Wagtail, is heard all over the State; even at night the male bird disturbs the air with an occasional call. These little insect-eaters will always be with us unless the depraved custom of egg-collecting for amusement eventually wipes them out.

The Wagtail builds a cup-shaped nest of bark and cobwebs, lined with fibrous roots or hair, preferably in a tree overhanging water. Very frequently the nest of a pewee, or magpie lark, is found in the same tree. The eggs are of a creamy ground colour, spotted at the larger end with yellowish brown. Three or four constitute a sitting, and, under favourable conditions, the birds rear two or even three broods in the one season; but they have

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"WILLIE WAGTAIL."

RHIPIDURA TRICOLOR, *Vieill.*



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"SCISSORS GRINDER."

SISURA INQUIETA, *Lath.*

many native enemies, such as lizards, and if boy collectors are added to the list of despoilers, there will be danger of the "Shepherd's Companion" vanishing, as the shepherd himself has vanished, with the increase of population. A string of egg-shells may or may not be a bright ornament to a bush home; it is certainly neither as beautiful nor as useful as a score of Willie Wagtails scattered in pairs about the farm and homestead, flirting their tails from side to side, whilst they seek in grass, crops, and trees the insects which provide their food.

12. The Scissors Grinder.

A bird often mistaken for the Willie Wagtail by those who are not well acquainted with our feathered friends is the Restless Fly-catcher, or "Scissors Grinder"; but there are marked differences between the two, although from our point of view they are both extremely valuable. The Scissors Grinder is slightly larger than the Wagtail, and the whole of the under surface is pure white, whereas the Willie Wagtail has a black throat. The narrow white line over the eye is also missing in the Scissors Grinder, and it has a yellow wash on the chest, whilst the plumage is dark steely blue, as against the sooty black of the Wagtail. It has the habit, when excited, of raising the head feathers into a crest.

The call of this bird should be sufficient to distinguish him at once, as the "Sweet pretty creature" of the Shepherd's Companion is replaced by a harsh, grinding note, like the sharpening of a pair of scissors upon a stone, whence the popular name is derived. This cry is uttered whilst the bird hovers a few feet above the ground in search of insects, but when perched upon the end of a branch it frequently gives a single harsh note, sometimes ending with a double whistle, "tu-whee tu-whee."

The Scissors Grinder is found throughout the whole of the continent, but inland it usually frequents the margins of rivers and creeks. It is a permanent resident of New South Wales. It is more conspicuous in spring and summer, simply because in autumn and winter it is almost silent. It is a stationary species, and may be seen along the watercourses throughout the winter, still searching for insects; though a black and white bird which makes little or no sound does not readily attract attention.

The nest is similar to that of the Willie Wagtail, but usually thinner-walled and slightly larger in size, and is generally to be found in a gum-tree, in an acute angle near the extremity of a limb, from 20 to 60 feet from the ground. The eggs are somewhat like those of the Wagtail though a little larger, but the spots or markings are of a purplish-brown colour. Four usually constitute a sitting.

Mr. North says:—

> The food of this species consists chiefly of insects of various kinds, principally flies, small moths, and butterflies, captured more frequently while on the wing. It also eats caterpillars, and materially assists in ridding orchards of many injurious pests.

With the Jacky Winter, it is well and favourably known in the orchards of the County of Cumberland. At times, the jarring notes of the birds, particularly round the house, tempt one to obtain peace with a pea rifle; the

price is a high one, when it perhaps means the loss of portion of a crop from the ravages of insect pests.

But it is in the western districts that the Scissors Grinder promises to be useful to our people in the near future. In Western Riverina and along the Darling, it still chatters in the river paddocks, and nests in the eucalypts which line the banks. We have now begun to spread the waters of the western rivers over the plains, in order that the fertile soils of those regions may produce their crops of fruit, lucerne, and vegetables. With the crops will come their parasites, as surely as we see them in the eastern portion of the State to-day. Every effort should be made now to preserve our western insectivorous birds, so that the "balance of nature" may not be disturbed, and this most recent development of Australian agriculture may not be handicapped from the start.

The Millers' Pest.

In December *Gazette* Mr. W. W. Froggatt, Government Entomologist, gave an account of the fumigation, under his supervision, of the Tamworth Milling Company's mill, to destroy the Mediterranean Flour Moth (*Ephestia Küehniella*, Zeller). At the request of Messrs. McIntyre and Sons, proprietors of Quirindi Patent Roller Flour Mills, Mr. Froggatt recently superintended the fumigation of that mill on similar lines. Cyanide was used at the rate of 1 lb. to every 1,000 cubic feet of space. Less acid was used than at the Tamworth mill, the formula being 1 oz. sulphuric acid to 1 oz. cyanide of potassium and 3 oz. water, but the generation of the gas was just as good, if not a little better. The kerosene tins were washed on the inside with boiling pitch, which acted as an enamel and prevented the free acid from eating through the tins before the cyanide was added. The use of kerosine tins is a great saving where 16 to 20 generators are required.

The mill was opened out eighteen hours afterwards, when traces of gas could be found on every floor, but no moths or caterpillars with life in them could be found in any part of the mill. In the basement many dead mice were strewn on the floor, showing that they had been driven out of their burrows and hiding-places by the gas.

Remedy for Black Aphis.

Mr. L. J. Smith, Inspector under the Fruit Pests Act, Singleton, has tested by experiment a simple remedy for black aphis on peach trees, and found it very successful. A strip of merino sheepskin wool, about 9 inches wide, tied around the trunk of the tree before the aphis appears. As the wool is of a greasy nature, it is impossible for the aphides to make their way through, and by attending to the bandage they can be destroyed in hundreds.

Harness, Harness Fitting and Repairing

[Continued from Vol. XXI, page 1035.]

A. H. E. McDONALD,
Instructor in Agriculture, Hawkesbury Agricultural College.

REPAIR OF HARNESS.

ALTHOUGH this is commonly considered to be within the province of the saddler, and consequently is neglected by the farmer, there is no reason why the latter should not make many of his own repairs. Those required are often very simple, and the following details are given, so that those who are not in a position to obtain training may be able, by studying them carefully, to acquire a knowledge of the work.

It is necessary to bear in mind that, although the process may appear complicated, it is not really so, and can easily be mastered. Time is always available for doing odd jobs, and by following the instructions no difficulty will be encountered in making ordinary repairs, and the harness will be kept in good order at little expense.

It is not proposed to deal with the more complicated work, such as the restuffing of collars, &c.—this must be left to the trained man—but merely to show how many simple repairs can be neatly and strongly made.

The Outfit.

The following list comprises a fairly complete outfit for effecting repairs. Whilst with these almost any class of work can be done, the possession of them all is not essential; for instance, much useful work can be accomplished with an awl, needle, and thread. Costs are given, but are only approximate:—

		s.	d.
1 pair clams		3	6
1 „ pliers, No. 3		1	6
1 dozen awls, assorted		0	6
1 „ awl-handles		1	0
1 „ collar needles, assorted		2	0
2 packets needles, Nos. 2 and 4...		0	8
1 saddler's compass		1	6
1 round knife		5	0
1 saddler's hammer		2	0
1 edge tool. No. 2		1	0
2 tongue punches, Nos. 35 and 37, at 1s. 6d. ...		3	0
4 round punches, Nos. 3, 4, 5, and 6, at 6d. ...		2	0
1 fine saddler's shoulder-crease		2	0
1 single hand-crease		1	0
1 saddler's palm		1	0
Total...	£1	7	8

A saddler's plough, which costs about 15s., facilitates the cutting of leather, but is not essential.

The different materials which are required in renovating harness, with the approximate costs, are :—

	s.	d.
Pitch, per lb.	0	3
Resin „	0	3
Wax „	1	0
Best brown hemp, No. 2, per lb.	3	0
Tacks, per packet	0	3
Bridle leather, per side	17	6
Harness leather, per lb.	1	3
Collar-check, per yard	2	0
Brown serge	3	0

A small leather apron, about 12 inches by 4 inches, is required. This is suspended from the waist and hangs over the right thigh. A small S hook, for holding the hemp whilst making the thread, is also needed. A suitable bench is shown in Fig. 14.

Use of the Tools.

The Plough is somewhat expensive, and its work can be done by other tools, such as the round knife. The chief parts are a cutting blade and gauge. By setting it to the right width a strip of leather can be rapidly and accurately cut. (Fig. 9.)

The Round Knife is almost indispensable. It is the most suitable tool for shaving or bevelling leather, and is also used for cutting leather into straps or any other form. The line of cutting is marked with the compasses, and the round knife entered and steadily pushed forward along the line, keeping the left hand in front to hold the leather firm. The cutting is done on wood in the direction of the grain, and the surface must be free from nails. (Fig. 10.)

Compasses are required for marking the lines for cutting, and for marking distances.

The Edge Tool is used for taking the sharp edges off the leather after it has been cut. If these edges are left, the leather readily frays or cracks. The tool is run along the edge with the right hand, and the work steadied by keeping the left hand in front. (Fig. 11.)

Punches are used for making the different holes required in leather working. The round form is used for making the holes in straps for receiving the tongue of the buckle. The tongue punches are used for cutting the hole for the heel of the tongue.

The Creases are used for making ornamental lines on the leather (Fig. 12). These lines do not increase the strength of the leather, but add much to its appearance. The crease is heated over a candle, and after wiping off the candle-black the crease is pushed along the leather until a sufficiently marked depression is made.

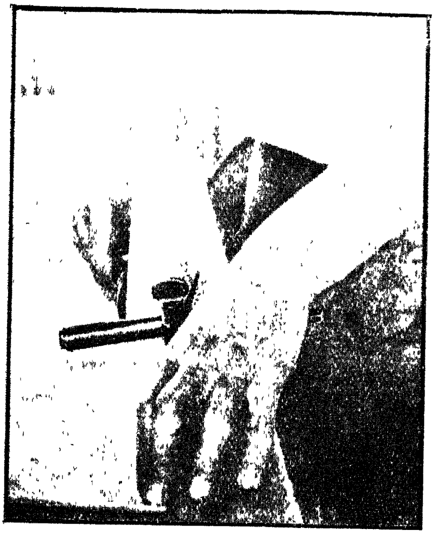


Fig. 9.—Cutting leather with the Saddler's Plough.

Fig. 10.—Cutting with the Round Knife.

Fig. 11 —Trimming a strap with the Edge Tool.

Fig 12.—Creasing a strap.

Awls and Awl-handles.—The awl-blades are attached to the handles by first pushing the heel of the blade into the handle as far as possible with the hand. The handle and blade are carefully examined to see that they are fitted truly, and then the blade is securely held in the vice, while the handle is driven down on to it with a light hammer.

Three kinds of awls are used :—

(1) A curved awl, slightly flattened at the point, but otherwise round. This is used when the work cannot be stitched right through, but from one side only.
(2) A round straight awl, tapering gradually from the handle to the point. This makes a round hole, the size of which depends upon the distance the awl is pushed through. It is used where single holes are required, and in beginning and ending long stitching.
(3) A diamond awl, used in ordinary stitching. Several of these, to suit the different sized threads used, are required.

Confidence is the chief requirement in handling the tools, and a little practice soon makes the learner familiar with their use.

The Thread.

A good thread is the first essential in making strong, lasting repairs. Good hemp must be selected, and considerable care exercised in the making. For convenience the hemp is kept in a small tin, with the end passed through a hole in the lid. The end is caught between the second and third fingers of the left hand, passed round the **S** hook, which should be about 3 feet away, and brought back and caught by the thumb and first finger of the same hand. Break the hemp by gently pulling with the left hand, while unravelling by rolling it downwards and away on the apron with the right hand. The breaking must be carefully done to obtain a fine tapering point.

This process of passing the hemp round the hook is repeated until sufficient strands are brought together to give a thread of the required strength. This is determined by the class of work to be done. In light work two strands are used, while five or six are usually required for heavy stitching.

When sufficient strands have been brought together, the end is taken between the thumb and first finger of the left hand, and the thread twisted by rolling with the right hand on the apron. The twist is kept in by catching the thread up by the finger and thumb of the left hand. The amount of twist determines its fineness, strength, and evenness. When well twisted, wax freely but quickly by rubbing the wax briskly up and down right to the tips. A little more wax is applied to the tips than to the remainder, so that the needle can be more easily and securely attached.

It must be remembered that the threads are not doubled before twisting. A fine tapering tip is required at each end for the attachment of a needle, and this can only be obtained by twisting the thread from end to end without doubling.

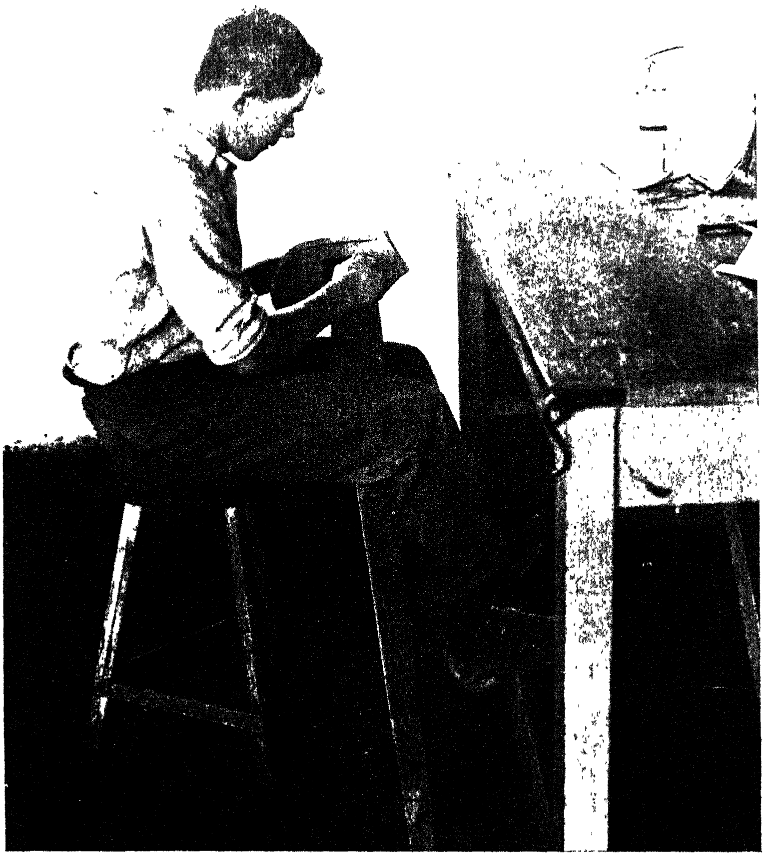


Fig. 13.—Stitching—showing the position in which the work is held.

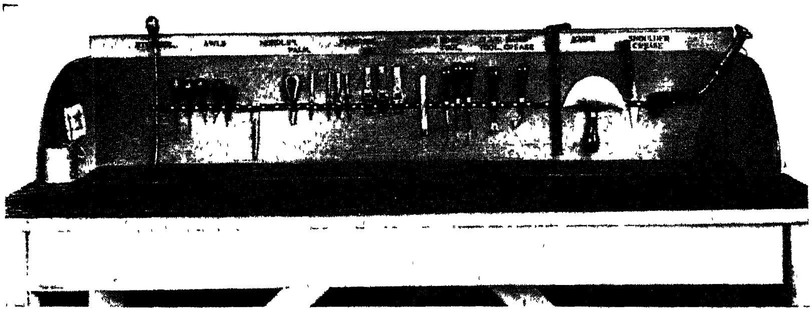


Fig. 14.—Bench and Tools for leather-working.

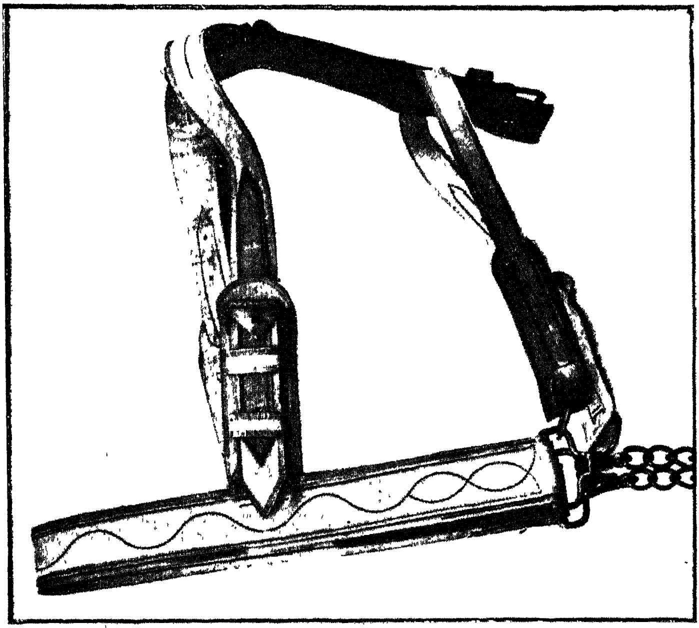


Fig. 15.—Dray Breeching—a product of the manual training class in harness-making, Hawkesbury Agricultural College.

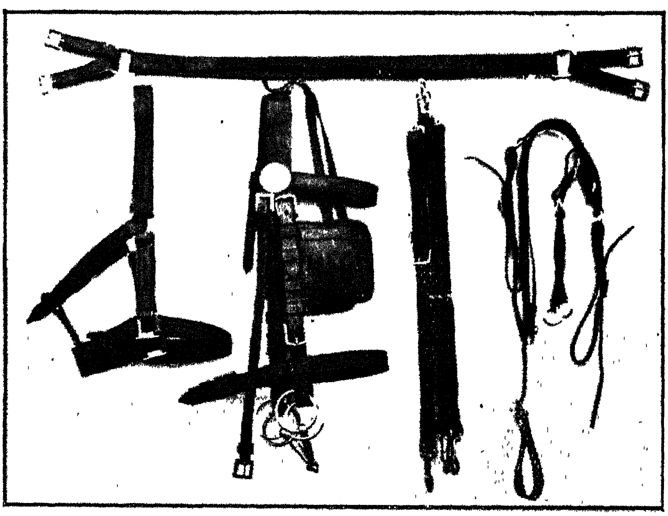


Fig. 16.—Winkers, headstall, straps, &c., made by students.

Wax.

Wax is applied to retain the twist, to give strength and smoothness, and to preserve the thread. Two kinds are used, beeswax where black threads are not desirable, and cobbler's-wax.

The latter is most suitable for heavy stitching, and is composed of—

1 lb. Pitch, 4 oz. Resin.

The pitch and resin are heated until thoroughly liquefied and intermingled, when the composition is poured into cold water, in which it can be conveniently preserved. When required for use, a piece about as big as the top of the thumb is cut off with a wet knife, and held whilst being used in a piece of soft leather to prevent it sticking to the fingers.

These proportions of pitch and resin make a suitable wax for use in warm weather, but in winter it becomes hard and brittle. This can be overcome by making a mixture of—

1 lb. Pitch, 3 oz. Resin, 3 oz. Mutton fat.

The thread sometimes becomes hard or sticky when cold, and will not run well. This can be remedied by smearing the fingers with raw beef or mutton fat and passing them up and down the thread a few times.

Threading the Needle.

In saddlers' work stitching is not done with a needle and thread such as is used in stitching cloth. A single thread is used, and a needle attached to each end. The needles must be threaded securely, and in such a way that the thread, where it leaves the eye, is not thicker than the needle. If it is larger, either the thread or the needle will be broken in stitching.

To thread the needle, pass about 1½ to 2 inches of the tip through the eye (see A, Fig. 17); pass the needle through the thread (B); draw the thread through as far as t will go, and twist the loose end which is shown, well round the thread (C); draw the needle through the thread two or three times at a place near to the point where the end of

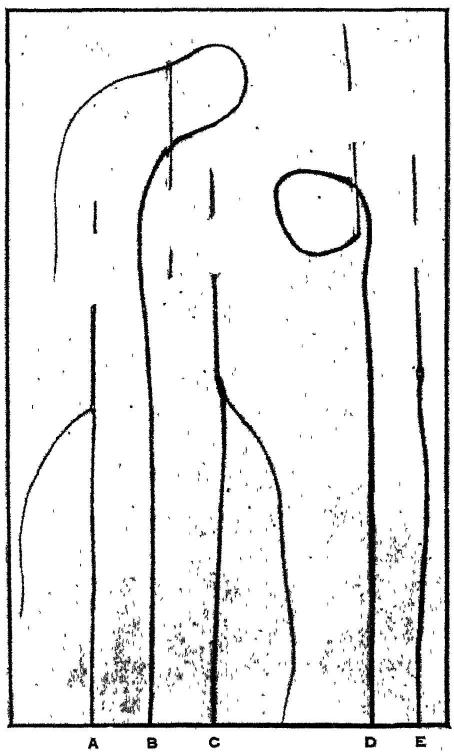


Fig. 17.—Threading the Needle.

the tip has reached, but between that point and the eye of the needle (D). By drawing the needle and thread through itself in this way, the tip is woven to the thread and kept from unravelling. The finished thread, after smoothing down with the finger and thumb, is shown at E.

The Requirements of Good Stitching.

To obtain good stitching, it is necessary that—

1. Thread of a kind and strength suited to the nature of the work be selected.
2. The thread be smooth, well twisted, and well waxed.
3. The stitches be all drawn equally tight, and made as firm as possible without cutting the leather.
4. The needles be used in the right way.
5. The right kinds of awls be selected and correctly used.
6. The stitches be made towards the operator.
7. The work be closely and firmly held in the clams.
8. The stitches be of equal length.
9. The holes be of equal size and angle.

Preparing for Stitching.

When neat work is required, wheel-prickers are used to mark the line of stitching. These can be fitted with wheels to mark for any number of stitches per inch. The points on the wheel cut into the leather and make a distinct mark where the holes are to be made with the awl (Fig. 24).

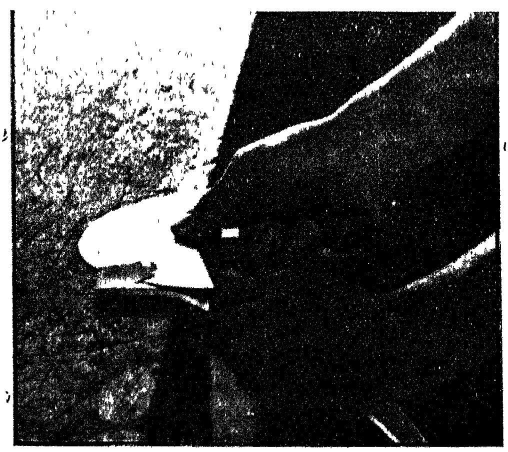


Fig. 18.—Shaving leather with the Round Knife.

It is necessary to have the work securely fastened so that it will not move whilst being stitched. Cut tacks are used for this purpose, and are drawn when the work is finished.

The sharp edges of the leather must be removed. This is done with the edge tool. Edge tools are made in various sizes to suit the class of leather.

The ends of the leather must frequently be bevelled before stitching, to obtain an even thickness and smooth surface; as, for instance, in stitching on a buckle. This is done by shaving the ends down with a round knife (Fig. 18).

Stitching.

The work, whilst being stitched, is held by the clams. These are held between the knees, and are kept in position by resting the end on the floor, passing the clams under the right leg, and resting them on the left. By their use the hands are left free for stitching. The operator must sit with his thighs horizontal, or the clams will tend to slip away. (See Fig. 13.)

The awl is pushed through the leather from the upper side at a slight angle. This, besides preventing the holes tearing into each other, allows the thread to be drawn tighter. To facilitate the use of the awl, saddlers usually cut a flat place on the handle, and by always keeping the thumb on this, the right angle is secured without difficulty. (Fig. 19.)

Fig. 19.—Using the awl.

When the first hole has been made the needle is passed up from below, and the thread drawn through until an equal length is on each side. The next hole is then made with the awl and the lower needle brought upwards through this, and when the thread has been drawn through about 3 inches, the upper needle is passed downwards through the same hole. (Fig. 20.) The awl makes a diamond-shaped hole, and the thread brought up from below must be kept in the angle nearest the stitching already done—the lower end—while the thread taken downwards must be kept in the upper angle. This can be done by pulling downwards a little with the upper hand, while the lower hand is drawn slightly towards the operator. Each thread must be firmly drawn when pulled through.

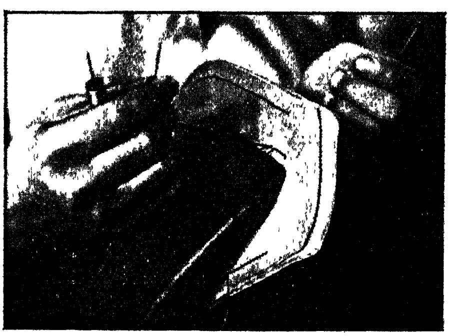


Fig. 20.—Stitching.

This is continued until the required amount of stitching has been done, when the thread is secured by turning back a stitch, using a round awl for making the hole. The thread when passed through is cut off flush with the surface of the leather.

Some of the Repairs which may be Made.

By following the above directions, much useful repairing may be done by the farmer in his spare hours, and besides being profitable the work will be found interesting. What can be accomplished is shown by the illustrations, which are from photographs of some articles made by students after a short course of training.

Broken winkers can be repaired, lost buckles replaced, and backbands and bellybands, which are damaged, made strong again. Traces can be made safe, and the unsightly, dangerous knots, often seen in reins and other parts of the harness, replaced by strong, neat stitched repairs. These notes will have served their purpose if they are an encouragement to the user of harness, who has not ready access to a saddler, to attempt his own repairs. It will be found that neat, strong work can be easily done, and that the details are soon mastered. Much of the work is merely cutting-out and stitching, and by close examination of the harness and imitation of it, nearly all repairs can be accomplished. Many articles, such as bridles, straps, belly-bands, &c., can also be made without difficulty. These can be cheaply bought, but provided good leather and hemp are obtained, the home-made article will probably have the merit of greater strength and durability.

Those who are ambitious enough to desire to enter more deeply into the work will find directions for making all kinds of farm harness in "Hasluck's Harness Making," and other publications.

Horse Rugs.

Some difficulty is often experienced in securing a rug to the horse so that it fits him comfortably without slipping off. The best method of accomplishing this is to attach flank straps, instead of the crupper that is often used, and to have the usual girth and chest straps. When flank straps are adopted it is not necessary to buckle any of the straps as tightly as when a crupper is used.

Although rugs can be bought cheaply, they are often home-made, and the following instructions will be useful:—The rug consists of a canvas covering and an inside lining of some warm material such as serge. For ordinary horses the covering is made 6 feet square, and when the strips of canvas have been stitched together, a curved piece is cut out over the withers. This piece is cut out 10 inches deep in the centre, and is 4 feet wide at the base.

The edges of the canvas are doubled up twice to give a good firm hem about half an inch wide. The inside lining is 4 feet wide, leaving 1 foot on each side of the canvas covering unlined.

The buckles for the flank straps are put just in front of the back hem, 1 foot in from the edges on the outside, and the straps taken through a slit near the hem of the canvas. A "D" is stitched on the inside of the rug about 20 inches forward from the back hem, and 1 foot in from the side, for the attachment of the flank straps by clips. The straps are made about 5 feet long so that they can be adjusted to the size of the horse. The girth,

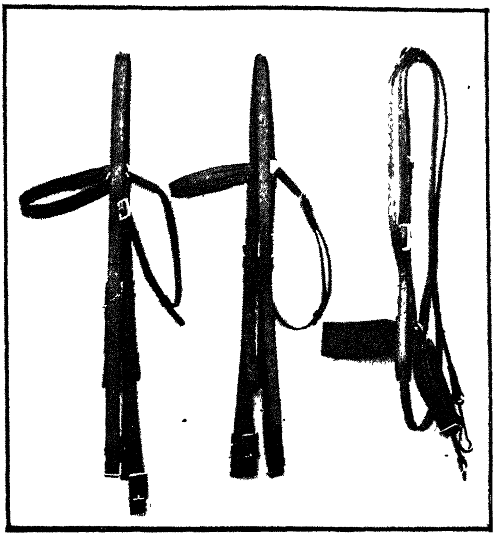


Fig. 21.—Bridles and Headstalls made by students at the Hawkesbury Agricultural College.

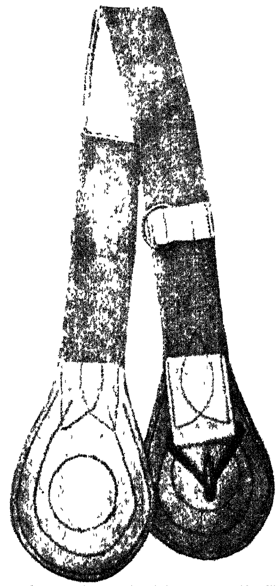


Fig. 22.—A repaired back-band.

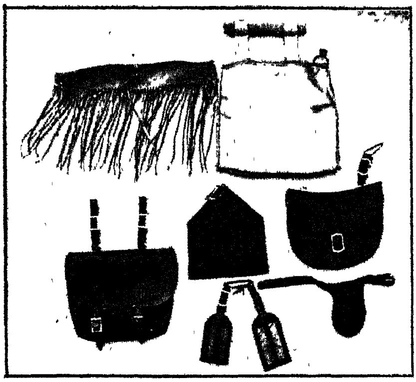


Fig. 23.—Water-bag, cases, &c., made by students.

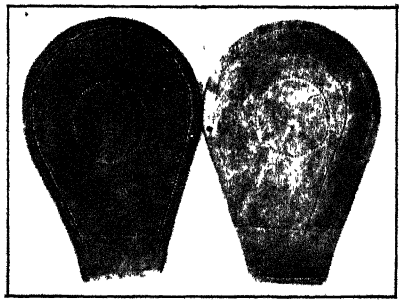


Fig. 24.—Marks left by the Wheel-pricker as a guide to stitching.

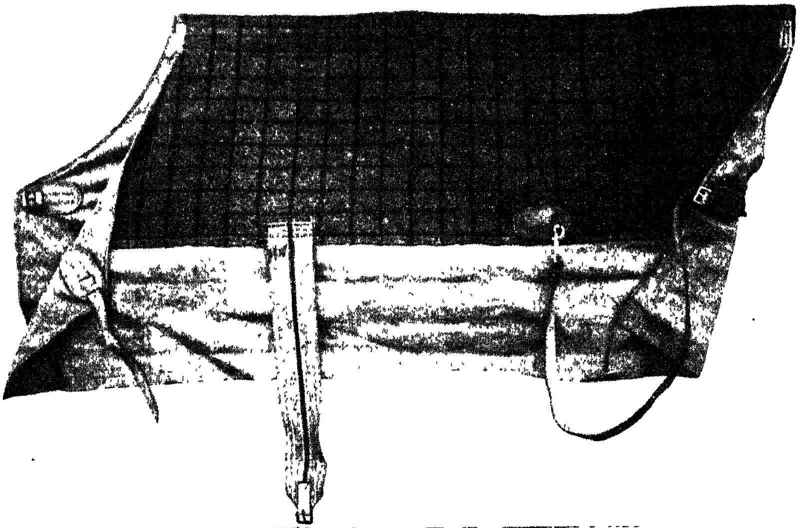


Fig. 25.—Horse-rug, showing the position of the straps, buckles, &c.

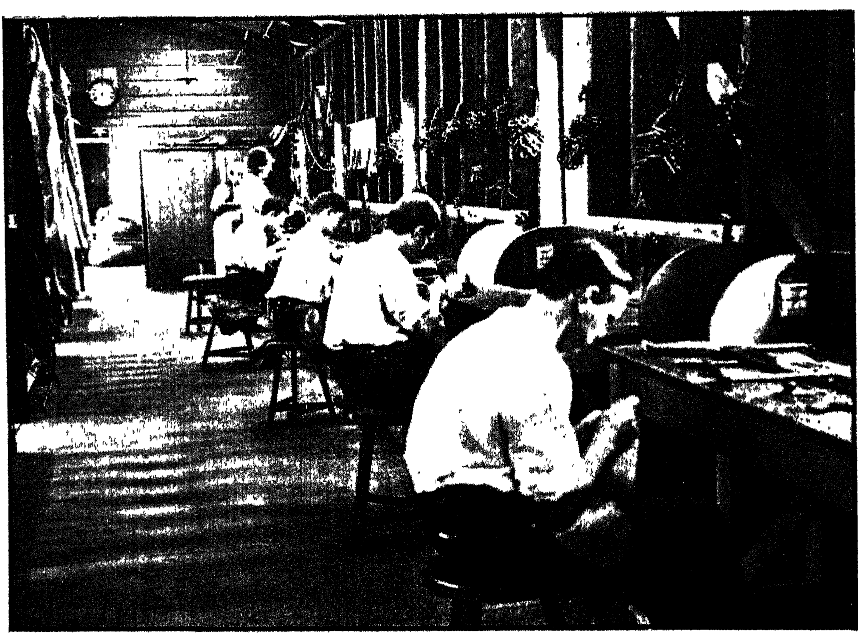


Fig. 26.—Class of Students at the Hawkesbury Agricultural College, receiving instruction in harness-making.

which is 2 feet 6 inches long, is stitched on the inside, 22 inches back from the front hem, and 1 foot in from the side.

The girth strap is 18 inches long, and is attached in the same relative position as the girth on the opposite side. The chest strap and buckle are placed on the front hem on the outside, 1 foot from the side. To make the rug stronger, a strip of leather about 2½ inches wide, may be stitched down the centre on the outside.

In attaching all buckles and straps, care should be taken to have them stitched on to the inside lining as well as the canvas covering, and not placed where the stitches will pass through the canvas only.

Fig. 25 illustrates a horse rug and the positions of the buckles and straps.

[NOTE.—This series will shortly be available as a Farmers' Bulletin.]

SHEEP ON THE NORTH COAST.

UP to the present, sheep have not been kept with very satisfactory results in North Coast districts. The climate is moist, and the soils rather too heavy, which, together with the richness of the pastures, precludes their being kept with profitable results. For a number of years a small flock has been maintained at the Wollongbar Experiment Farm, but it has been decided to discontinue with sheep at this centre, as it has been amply proved that the district is unsuitable for sheep as compared with the better returns obtainable from dairying. Sheep, however, have been kept with rather better results at Grafton Experiment Farm, and it has been decided to extend the operations there.

Success with sheep under the special local conditions prevailing, will depend largely upon selection of breed. Only those breeds which possess the hardiest constitution and are most resistant to foot-rot and internal parasitic affections should be employed. The Department has selected the Romney Marsh as the most suitable breed for the North Coast, and this breed in its pure state is now being kept at Grafton. It is not considered advisable to cross with any other breed, as the probable result would only be to weaken the special suitability which the Romney possesses for such a climate.

Farmers desirous of experimenting should obtain pure-bred Romney Marsh ewes; or if these are not procurable, cross-bred ewes possessing Romney strains. Romney rams should then be continued with on the subsequent progenies.

PROTECTION OF JUDGES AT SHOWS.

THE Lachlan P. and A. Association (Hillston) recently disqualified a member for two years for writing an insulting letter to a judge at the Association's Show.

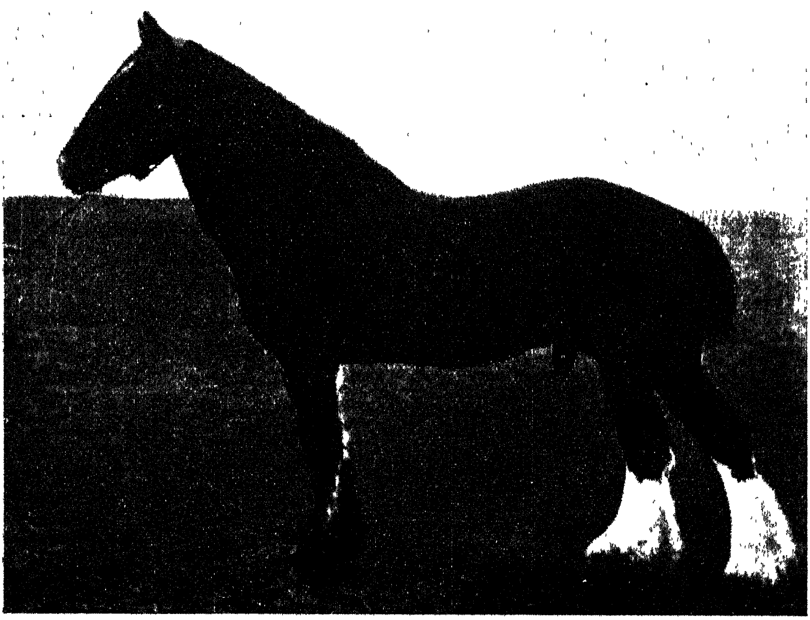
Pedigree Horses on the Darling.

Messrs. Chaffey, Salmon, and Dunne, proprietors of Tolarno Station, Menindie, have some excellent draught stock, including the two stallions "Crown Prosecutor" and "The Poet," whose photographs are reproduced herewith. The pedigrees of these two horses go back as far as fifty years, including on both sides many first-prize winners and champions in New Zealand and the Old Country.

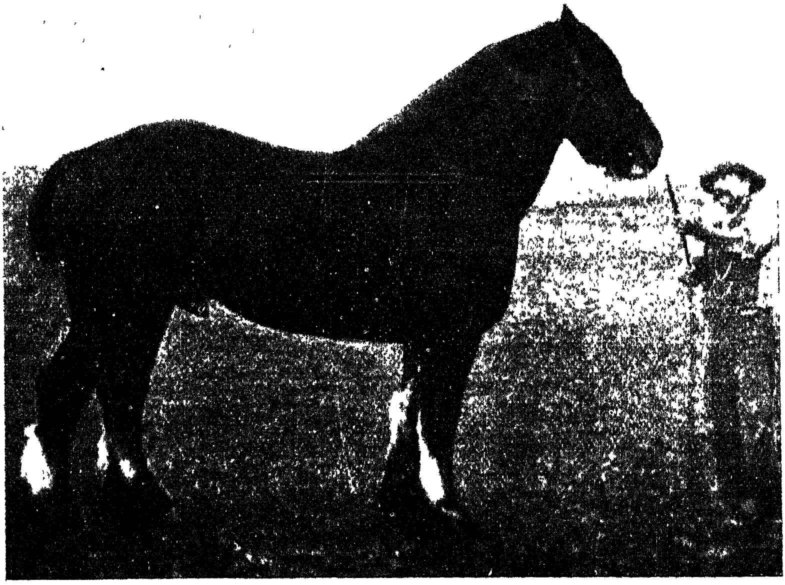
The adjoining station, Netley, owns the thoroughbred horse "Maelgewyn," a full brother to "Malster," whose pedigree can be traced over 100 years.

At Tolarno they have about 150 brood mares and 700 head of horses of all ages, some of the young half-bred draughts being very fine, and giving promise of making very useful farm horses. They have also a fine lot of drivers and hacks for station purposes.

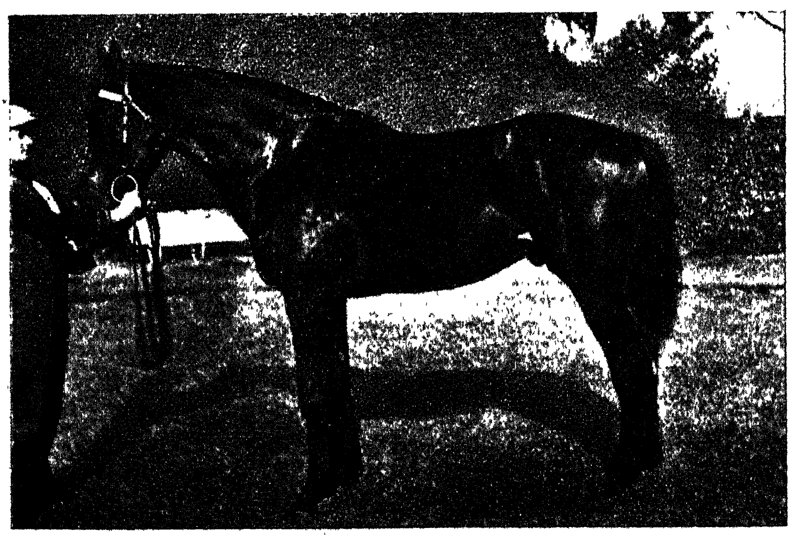
These photographs show that some at least of the large landholders are making efforts to improve the general character of the horses in that district, and they promise well for the future of horseflesh in "the land of great distances."—W. J. Allen.



Draught Stallion, "Crown Prosecutor" (Imported from New Zealand). Tolarno Station, Menindie.



Draught Stallion, "The Poet" (imported from New Zealand).
Tolarno Station, Menindie.



Thoroughbred Horse, "Maelgewyn" (a full brother to "Maister").
Netley Station, Menindie.

NOTICE TO HOUSEHOLDERS.

Destroy the House-flies.

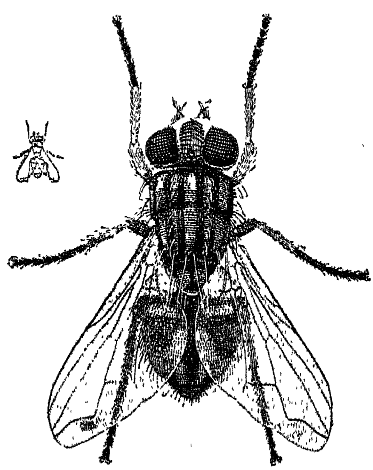
THERE SHOULD BE NO FLIES IN A CLEAN TOWN.

FLIES breed in filth, crawl over and feed upon filth, and then fly into the house and leave disease germs and filth upon all exposed food.

Typhoid, consumption, bowel complaints, and other germ diseases which develop in dirty surroundings, **can be and often are contracted and spread** through the presence of flies.

House-flies are the direct cause of many deaths in Australian towns every year.

House-flies lay their eggs **chiefly in fresh stable manure,** but also in fermenting rubbish. From these eggs maggots hatch out, which feed upon this material, and in a few days in midsummer are full-grown and pupate, and from the pupal shells they emerge as perfect flies a few days later.



Precautions.

Keep all food from contamination by flies, particularly foods to be eaten cold or uncooked.

Keep milk covered with net or muslin, and meat and food in wire safes or covers.

Keep the flies out of the rooms with gauze screens on doors and windows.

Kill flies by placing formalin in saucers in the rooms (one tablespoonful to a pint of water) and sprinkle pyrethrum (insect powder) inside the windows, or burn a little in the room.

Prevent flies from developing by removing stable manure every three days, and keep it covered up. All kitchen rubbish and garbage should be covered up and buried or burnt.

Entomological Branch, Department of Agriculture, Sydney, N.S.W., December, 1910.
Published by direction of The Hon. DONALD MACDONELL, M.P., Minister of Agriculture.

Changes occurring in the Production of Silage.

F. B GUTHRIE.

THE principal changes which occur in the conversion of green fodder into silage are the disappearance of the sugar, the more soluble kinds of cellulose, and part of the protein matter in the green fodder, and the formation in the silo of volatile and fixed fatty acids, amino acids, purin bases, &c. There is a considerable loss of dry matter. The loss of protein matter itself is not very great, but the digestibility, and consequently the nutritive value of the protein in the resulting silage, is considerably lowered. Consequently, highly nitrogenous green feeds are not economically employed in making silage.

These changes are brought about by three distinct causes, viz., the chemical action of the living cell, the action of enzymes, or soluble ferments, and the action of bacteria.

According to Messrs. H. E. Annett and E. J. Russell,* who have studied the changes produced in the conversion of green maize to silage, and have given the most lucid explanation of these changes, the following table represents the composition of the green maize fodder originally taken, and the resulting silage (in percentages):—

	Original Maize fodder.	Silage.
Dry matter	16·81	12·99
Ether extract	0·48	0·39
Protein (total nitrogen × 6·25)	1·78	1·45
Nitrogen-free extract (carbohydrates, soluble cellulose, &c.)	9·33	5·38
Ash	1·00	0·98
Fibre	4·21	4·82
Sugar	1·0	Nil
Total nitrogen	0·285	0·234
Proteid nitrogen	0·214	0·137
Non-proteid nitrogen	0·071	0·103
Volatile acids (as H_2SO_4)	Nil	0·10
Non-volatile acids (as H_2SO_4)	Nil	0·50

It will be seen that about 9 per cent. of the nitrogen-free extract in maize-fodder consists of sugar (dextrose). This entirely disappears in the process of conversion into silage. There is a loss of the total nitrogen (probably given off as ammonia and ammonium salts), the principal loss being in the proteid nitrogen, of which about 40 per cent. disappears, and is partly converted into non-proteid compounds, such as amino-acids, &c. There is also the characteristic production of volatile and fixed organic acids.

According to E. J. Russell,† the course of these changes is shortly as follows:—

When the silo is first filled, the cells are still living and the vital processes continue. Respiration goes on which, in the living plant, results in the

* Journal of Agric. Science, vol. ii, p. 382, &c. † *Loc. sit.*, p. 392.

oxidation of the sugar and its conversion into water and carbonic acid. In the silo this oxidation is incomplete, as air is excluded, and intermediate products are formed, such as alcohol and acetic, butyric, and similar acids. The whole of the sugar is then decomposed, and as no new material is formed (as in the case of the growing plant) the sugar disappears, its place being taken by the acids characteristic of silage. At the same time the protein matter of the plant is broken down (hydrolised) by the soluble ferments present in the original cell, and it is partly converted into the usual products of protein decomposition, mono- and diamino-acids, purin bases, &c., lactic and malic acids, and ammonia. As a result of all this chemical action, heat is developed and raises the temperature of the mass. After a time, there being no new material formed to replace the material of the cell, the cell dies, and with its death chemical action ceases, and the temperature falls.

The changes described above, the conversion of sugar and other carbohydrates into alcohol, acetic and butyric acids, water and carbon-dioxide, and the splitting up of the protein matter, are the primary and essential changes in the production of silage. The action of bacteria, though always present and considerable in extent, appears to be confined to the splitting up of the less resistant kinds of cellulose and their conversion into humus substances and various fatty acids. The fibre and mineral matters are practically unchanged.

Sweet and Sour Silage.

The production of sweet or sour silage depends chiefly upon the temperature produced within the silo, and this, in turn, depends upon the manner in which it is built up.

Sweet silage is formed when the silo is filled slowly before being compressed. In this case air has comparatively free access, and, consequently, chemical action is vigorous and a high temperature is produced, with the result that the acid-forming bacteria are destroyed, and only relatively small proportions of acid are formed, those like acetic and butyric, which we have seen result from the oxidation of the sugar.

If, on the other hand, the silo is filled and pressure applied rapidly, so that air is excluded, the temperature does not rise so high; the acid-producing bacteria are more vigorous, and additional quantities of volatile and fixed acids are formed from the soluble cellulose.

Sour silage is formed when the temperature does not rise above 120 degrees Fahr. The acetic acid bacteria are destroyed at 104 degrees Fahr.; butyric at 86 degrees Fahr.; the lactic acid bacteria thrive best at about 120 degrees Fahr. Sweet silage is produced when the temperature of the silo rises to 125 degrees to 140 degrees Fahr.

Formation of Mould.

This does not take place in the interior of the silo; indeed, well-made silage keeps good for a considerable time, the condition of things in the silo being adverse to the production of mould. The formation of mould is

confined to the surface, where the supply of air is plentiful, and the reactions that take place are the opposite of those which occur within the silo. There is no production of acids; on the contrary the mouldy parts are alkaline in reaction. There is a much greater loss of nitrogen, and the non-proteid nitrogen is converted into protein, being the opposite action to that which takes place in the interior. This is due to the formation of protoplasm in the mould-cells.

Digestibility of Silage.

With regard to the digestibility of silage, which has been referred to above, it is generally recognised that it is about the same as that of hay, both silage and hay being rather less digestible than the original green fodder. This is not due to any actual increase of indigestible material, but to the fact there is always considerable loss in the conversion of green crops into hay or silage (apart from the loss of water), and this loss consists, as has been seen, of substances like sugar, soluble cellulose, &c., which are digestible.

It is possible to lose as large a proportion as 20 per cent. in converting green crops into silage, and the material so lost is for the most part the digestible portion of the material.

On the whole, the loss of dry substance is less when the crop is converted into silage than when it is field-cured, and the silage, if properly prepared, is much more palatable to stock. There is, in addition, the risk—in the preparation of hay as dried fodder—that the stuff may be exposed to rain, which entails a considerable loss of material, whereas in the preparation of silage this danger is avoided.

The following table, which is taken from Jordan's "Feeding of Animals," is instructive, not only as showing the superior digestibility of corn silage as against the dried fodders, but also the greater digestibility of both these products when made from mature than from immature maize:—

	Digested from 100 parts Organic Matter.					
	Dried Corn Fodder.			Corn Silage.		
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.
Cut before haying (thirteen experiments).	71·4	53·6	65·7	77·8	56·6	67·4
Cut after haying (ten experiments).	74·2	61·2	70·7	80·2	65·2	73·6

The above figures were obtained from actual digestion experiments, and point to the desirability of cutting maize when just ripe for the purpose of silage.

Material such as oats and grass, which form constituents of some of the samples of silage examined (see below) are probably more economically disposed of by drying than by conversion into silage. The same applies, as has been remarked above, to highly nitrogenous green fodder, such as lucerne, peas, &c., as the proteid matter in particular, in which these are rich, is lowered in digestibility.

COMPOSITION and Feeding Value of different kinds of Silage.

The following are analyses of some samples of silage submitted from various farms in New South Wales :—

	Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen Free Extract.	Fat.	Volatile Acidity as H_2SO_4.	Fixed Acidity as H_2SO_4.	Nutrient Value.	Albuminoid Ratio.
1. Self-sown barley, with other plants ...	60·5	5·3	4·1	8·6	19·4	2·1	0·18	0·53	23·2	1 to 5·9
2. Wheat and wild oats	35·2	4·8	5·0	15·4	37·7	1·9	2·24	0·37	47 0	1 to 8·4
3. Maize, stalk and leaf	64 0	2·2	3·1	11·0	19·3	0·4	0·08	0·09	23·3	1 to 6·5
4. Lucerne, prairie grass, marsh mallow, thistles—Top of stack.	55·0	5·1	8·4	8·9	21·2	1·4	0·24	0·47	32 7	1 to 2 9
5. Lucerne, prairie grass, marsh mallow, thistles—Bottom of stack.	68·3	3·1	6·7	12·8	6·6	2·5	0·75	5·53	18·9	1 to 1·7
6. Very rough lucerne, made in hot weather, January.	52·8	3·4	8·5	13·7	19·9	1·7	1·27	0·48	32·2	1 to 2 8
7. Dry maize stalks after ripe cobs had been harvested—(Bathurst, 1908).	68·4	1·0	5·0	6·5	18·5	0·6	0·87	1·32	24·8	1 to 4
8. The same—(Bathurst, 1909)	73·1	2·7	3·5	6·6	13·6	0·5	0·13	0·80	18·2	1 to 4 2
9. Skinless barley and peas, open stack—(Wagga, 1909).	70·3	2·5	3·5	7·4	14·6	1·7	0·18	0·31	21·9	1 to 5·3
10 (a). Skinless barley and peas—(Wagga, 1910)—Top of stack, 2 feet from surface; temperature, 154 degrees Fahr.	76·0	2·0	3·0	7·4	10 9	0·7	0·13	0·03	15·4	1 to 4·2
10 (b). Skinless barley and peas—(Wagga, 1910)—4 feet from surface; temperature, 120 degrees Fahr.	73·8	2·5	2·8	7·0	13·0	0·9	0·37	0·10	17·8	1 to 5·4
11. Sour ensilage (maize) — (Hawkesbury Agricultural College, 1910).	77·2	1·4	1·9	6·2	13·0	0·3	0·54	1·20	15·5	1 to 7

Notes to Table.

Many of the samples of the locally-prepared silage had undoubtedly lost water on their way to the laboratory, and the figures do not represent their true condition in this respect.

In the case of No. 8, this silage was prepared in the same way as the previous sample (No. 7), except that the stacks were drier to start with, and a considerable quantity of water was added in making up the silo.

In the cases of 10 (*a*) and 10 (*b*), the silage was made in a pit and logged up. It will be seen that the higher proportion of acids was produced in the lower part of the silo, where the temperature had not risen above 120 degrees Fahr. In the upper portion, where there was freer access of air, and the temperature had risen to 154 degrees Fahr., the acid fermentation had been arrested. That is even more strikingly shown in Nos. 4 and 5, taken from the top and from the bottom of the stack respectively.

No. 11 was maize silage, preserved in a tub-silo (wooden stave) at the Hawkesbury Agricultural College, season 1910.

The Principal of the College has supplied the following notes regarding its preparation :—

The land was ploughed twice, also harrowed twice, and rolled. The corn was planted in drills 4 feet apart on January 10th, 1910, with F.F. corn planter (single grain system), at the rate of 12 lb. to the acre. The fertiliser used was equal parts of bone and blood manure and No. 1 superphosphate, 112 lb. to the acre. When the crop reached a height of 6 inches it was harrowed, and subsequently cultivated three times with spring-tooth cultivator. It was cut in the early part of May, when the cobs were just formed and the foliage still green. The crop was chaffed into a tub-silo with the Ohio ensilage cutter and blower. After filling, it was allowed to settle for three weeks, and filled again to the top No record was kept of the temperature. Yield of crop, 16 tons to the acre. Rainfall :—

January 10th to 31st	695½ points.
February	146 ,,
March	495½ ,,
April	80 ,,
May, one week	5 ,,
	14·22 inches.

The tub was opened up, and the contents used in November.

The following table, giving the average composition of a few typical examples of silage, is taken from American sources (Messrs. Jenkins and Winton) :—

	Water.	Ash.	Crude Protein.	Crude Fibre.	Nitrogen Free Extract.	Fat.	Nutrient Value.	Albuminoid Ratio.
Corn silage—mature corn ...	73·7	1·6	2·2	6·5	15·1	0·9	19·3	1 to 8
Corn silage—immature corn	79·1	1·4	1·7	6·0	11·0	0·8	14·5	1 to 7·5
Corn silage—ears removed...	80·7	1·8	1·8	5·6	9·5	0·6	12·6	1 to 6
Clover silage	72·0	2·6	4·2	8·4	11 6	1·2	18·5	1 to 3·4
Soy bean silage	74·2	2·8	4·1	9·7	6·9	2·2	15·9	1 to 2·9
Cowpea vine silage	79·3	2·9	2·7	6·0	7·6	1·5	13·6	1 to 4
Field pea vine silage ..	50·0	3·6	5·9	13·0	26·0	1·6	35·5	1 to 5
Sorghum silage	76·1	1·1	0·8	6·4	15·3	0·3	15·8	1 to 20
Corn-soy bean silage ...	76·0	2·4	2·5	7·2	11·1	0·8	15·4	1 to 5·2
Millet-soy bean silage ..	79·0	2·8	2·8	7·2	7·2	1·0	12·2	1 to 3·4
Cowpea-soy bean silage ...	69·8	4·5	3·8	9·5	11·1	1·3	17·8	1 to 3·7
Rye silage	80·8	1·6	2·4	5·8	9·2	0·3	12·2	1 to 4·1

Grass-seed Abscesses.

MAX HENRY, M.R.C.V.S., Government Veterinary Surgeon.

On several occasions recently, requests have been made to the Stock Branch that cattle suspected of being tuberculous might be examined by a veterinary officer. This was done, and on two occasions these cattle were found not to be suffering from tuberculosis, nor actinomycosis, but from grass-seed abscesses in the region of the throat and between the jaws. The lumps caused by these abscesses are in the early stages fairly round and well-defined, but later they burst outwards and discharge. The grass-seeds causing them are taken in with the food, and are arrested by their barbs in the mouth and throat, whence they gradually work into the soft tissues, causing irritation and the formation of pus. The abscess so formed enlarges and burrows downwards, causing at the same time the formation of a certain amount of fibrous tissue. Cattle affected in this way appear to be most commonly met with in the southern districts of the State, in certain parts of which a fair number of animals in any herd will show many old scars in the shape of thickened areas of skin around the throat, and others will show abscesses as enlargements which have not yet broken out.

In treating, they should be opened widely with a knife, not simply punctured, and cleaned out by squeezing, and swaboing out, or syringing with a disinfectant. It must be borne in mind, of course, that before a "lump" in the throat is so treated the diagnosis of a Grass-seed Abscess must be certain, as nothing could be more useless and dangerous than to so treat a tubercular or actinomycotic gland in the throat; and, therefore, whenever possible, the advice of a veterinary surgeon should be obtained.

A similar condition was investigated and reported upon by Professor J. D. Stewart, when Government Veterinary Surgeon, but for the information of Stock Inspectors, and others who may be interested, the following comparative statement is issued to assist them in arriving at a correct diagnosis:—

To Differentiate between a Tubercular Gland, an Actinomycotic Growth, and a Grass-seed Abscess.

Tuberculosis.	*Actinomycosis.*	*Grass-seed Abscess.*
1. An infectious disease, affecting lymphatic glands and all organs.	An infectious disease affecting jaw-bones tongue, lips, and pharyngeal glands.	A localised disease, affecting the soft tissues and skin of the throat and jaws.
2. In the head is strictly confined to the lymphatic glands.	Seldom found in the lymphatic glands.	Not confined to the seat of the lymphatic glands, and seldom corresponding.
3. Forms a round, or egg-shaped, firm swelling, slowly developing.	Forms a firm, badly defined, hard swelling, slowly developing.	Forms a fairly firm, round swelling, which may develop slowly or quickly.
4. Freely movable under the skin.	Not freely movable, and generally attached to bones.	Freely movable in some stages, but often quite close under the skin.
5. No tendency to break out.	Often breaks out and discharges from several points.	Often breaks out and discharges.
6. Pus is thick, yellow, and cheesy, or creamy.	Pus is thick, yellow, and gritty.	Pus is whitish-grey, thin, with some curds, and sometimes grass-seeds.
7. Pus not odorous.	Pus not odorous.	Pus very fœtid.
8. If gland is opened it does not heal up well.	If abscess opened it does not heal up well.	If abscess is opened it often heals up well and leaves a scar.

METHOD OF TREATING SUMMER CROP LEMONS.

THE following is a method of dealing with the summer crop lemons which I have carried out for a number of years with great success:—

As lemon growers will have noticed, there is a good deal of waste through the summer crop falling, owing to the heat and, perhaps, lack of moisture, before sufficient colour has been developed; and invariably those lemons that do remain on the trees will be too highly coloured on one side before the others colour at all.

This trouble may be got over by picking all fruit to a size (that is when large enough, irrespective of whether coloured or not) and storing in paper-lined cases, in a cool shed, or in the shade, provided some sort of covering is placed over the cases to keep off rain, &c. All that is necessary to line the cases is to place sheets of newspaper on the bottom and sides. Now fill the cases with fruit, and cover the top of the fruit with paper. Put the cases in a stack.

When they are stored in this manner a certain amount of sweating will take place, the skin will slightly toughen and ripen into a beautiful, clear, light-straw colour. Odd fruit will waste through rotting, and a slight shrinkage will be noticed in bulk, but this will be more than compensated for in the better prices obtained.

The stored fruit will need to be sorted out about every fourteen days. The trees also will need to be gone over at about the same intervals for a fresh supply of fruit.

There is no need to clip the fruit. More than ordinary care to avoid bruising is necessary. The handling is thus very little more than in marketing the fruit in the ordinary way.—WALTER B. STOKES.

COLD STORAGE OF LEMONS.

IN order to test the keeping qualities of Cumberland grown lemons in cool stores, the Department of Agriculture purchased ten cases of Lisbon lemons from Messrs. Phillip Bros., of Pennant Hills, and placed them in the Glaciarium Cold Store on 6th July last. It is considered that if our lemons will keep for six months at a temperature of about 40 degrees Fahr. it will be a great boon to the growers, as they will be able to store the fruit and place it upon the market during hot weather, when it is most required.

About the same time, the Fruit and Vegetable Growers' Union of N.S.W. asked the Department to arrange a similar experiment with fruit supplied by growers. The Department supplied directions as to picking, handling, and packing, and 33 cases were forwarded by the Union and placed in cold store in August. The fruit should have been picked and stored much earlier if it were intended to be kept for any length of time; nevertheless it is considered that almost any lemon would be in better condition for marketing if stored until the skin was tough and had lost its coarse look and much of its surplus moisture. Results of these tests will be published later.

Eradication of Prickly-pear.—A Suggestion.

Has anything ever been done in the way of using prickly-pear when in considerable areas, as suitable planting ground for trees, with the ultimate object of causing the thinning out, if not eradication, of the pest through shading? Under broad-leaved trees it is possible that the pear could not live; with us it certainly does not thrive under wild-apple, cabbage-gum, and stringybark, becoming starved and stunted. Certainly amongst small tea-tree (*Melaleuca*), it thrives near Windsor Railway Station, for instance; but there is plentiful light in this case. We have read that in India the seeds of white cedar are scattered where the pear is thick. The seedling trees are protected by the pear whilst young, and when they get a good head of leaves the pear becomes sickly and thins out, with the result that it is easily got at and cleared away with a minimum of trouble and expense.

Even with blackberry this might act. If we mistake not, in localities like the roadside near the top of Bulli Pass, the plant is far thicker close to the roads, or, in other words, where light is obtainable. We should like also to see some of the thickets of briar to be found near Yass tried in the same way.

If such a plan proved successful, it would only be necessary to start Nature to work by scattering seeds of suitable trees, whilst at the same time preventing further spread of all these pests as far as it can be done. This would also be one method of helping in reafforestation. Nothing would be lost, anyway, in trying the effect of such action.

Anyone wanting white cedar or pepper-tree seeds for the purpose, can obtain a packet by applying to the Principal, Hawkesbury Agricultural College.—C. T. Musson.

Malignant Dysentery in Bees.

This disease is becoming a common cause of trouble amongst bee-keepers. Specimens of diseased bees recently submitted to the Bureau of Microbiology have revealed the presence of the parasite *Nosema apis* (Zander), a close ally of the famous *Nosema bombysis*, which causes the disease known as "pebrine" in silkworms. The treatment commonly recommended is:—

1. Infected hives to be thoroughly cleaned out with carbonate of soda, dissolved in hot water.
2. Removal and destruction of infected combs, as it is by such contaminated combs that the disease is mainly spread.
3. Transfer infected swarms to clean hives provided with artificial combs.

The Director of the Bureau quotes the most recent pronouncement available (by Dr. Walter Malden, of Cambridge) that:—

> There does not appear to be any chance of saving a stock that has become infected with malignant dysentery, so that the only possible treatment is to destroy the bees and combs, and thoroughly disinfect the hive and the ground in its neighbourhood, which may have become contaminated by the dead bees or their excrement.

Budding and Grafting.

W. J. ALLEN.

THE processes of budding and grafting are the methods resorted to for the reproduction of specific varieties of fruits, where it is found that such varieties do not reproduce themselves from seed, or cannot readily be grown from cuttings or layers. When once a fruit of good quality has been raised from seed, recourse is had to either budding or grafting, in order the more quickly to secure a stock of trees which will produce fruit in every way similar to the parent tree. In order to perform this operation we remove from the parent tree, wood of the current year's growth, from which we take one bud at a time, if we are budding; or, if grafting, the scion or bud stick is cut into short lengths, each of which carries from two to four buds.

The operation called budding is usually performed during the growing season, when the bark slips easily, and consists in taking a bud from one plant and inserting it under the bark of another.

Grafting, on the other hand, is usually performed in the spring, about the time the buds begin to swell, and continues until the tree or stock is about to break into leaf. Some varieties of fruits are better grafted in early spring, before the buds have swollen to any appreciable extent—the persimmon, for instance.

Budding.

This method of working trees and stocks to the variety desired has largely supplanted grafting, as it is found to be simple and economical—simple, because it requires very little skill and practice to perform; and economical, inasmuch as the operation consists in applying a single bud to the surface of the growing wood of the stock; while, with grafting, there are usually two or more buds used on every scion. This is quite a consideration when wood of different varieties is scarce, and the nurseryman or orchardist wishes to make the greatest use out of his supply. The bud is inserted under the bark, and is applied directly to the cambium layer of the stock. Our nurserymen use this means almost exclusively in working their young fruit-trees, as well as in working roses and many ornamental trees. There are three seasons—viz., spring, summer, and autumn—when we perform the operation. By keeping the buds in cool storage until the trees break into growth, we can successfully bud almost any variety of fruit-tree in the spring.

Summer buds may be put in as soon as the buds on the spring growth of wood are properly matured. This is about the beginning of December. I do not, however, favour budding at this season, except, perhaps, for citrus trees, as deciduous trees will not generally make more than a weakly growth,

and, in consequence, are not fit to be planted out in orchard during the winter. Autumn, or, as they are more commonly called, dormant buds, are those inserted in February and March, and which lie dormant in the stock all winter, breaking into growth in the early spring. The following autumn they make exceptionally fine trees.

Autumn budding finds more favour with the nurseryman than any other season, as the young seedling stock is by this time large enough to take buds, and he finds that he raises a better tree than when raised from a summer bud; and, unlike the spring bud, he has not to go to the trouble of keeping his buds in cold storage, as he cuts them fresh every day or two as required.

Budding is best done in fine weather, avoiding hot, windy, or wet days.

Buds are usually inserted in young stock from 4 to 6 inches above the ground, but when old trees are being worked over they may be inserted in the branches close to the trunk of the tree, and just where a limb is required to give the tree a good shape. It is generally found best to put the bud on the under side rather than on the top of the limb, as, by inserting the bud on the top of the limb in an old tree, the growth is all inwards, thus unduly crowding the centre of the tree; while it is found that the growth from those inserted on the sides or underneath the limbs will, when grown, form a nicely-shaped tree.

In the cases of both budding and grafting, great care must be exercised to select nothing but good buds from the healthiest and best fruiting trees. Medium-sized shoots afford the best buds, and well-developed buds are the best to use. The buds towards the top are not usually well-developed, and those near the base are generally small and poorly developed; and, while they might grow all right, the chances are that they would not make such fruitful trees as those grown from the buds which are large and well-matured, and which have clustered around them two or more fruit buds. This applies more particularly to peaches, apricots, nectarines, and plums; it would not apply to apples, pears, &c. As soon as the bud stick is cut from the tree the leaves should be cut off just close to the bud, and the more quickly the latter is inserted the better; and this, together with the proper wrapping, is the reason why men accustomed to the work have better success than amateurs, as they never mutilate a bud when cutting it, and from the time it is cut until it is inserted is only a matter of a few seconds. The operator may carry his bud sticks wrapped in damp bagging during hot weather to keep them from wilting and spoiling. I could not advise putting them in water, as this tends to soften the bark and damage the bud.

The bud stick or scion from which the bud is to be cut being close at hand, the operator proceeds by taking hold of the stock with his left hand, and with a *sharp* budding-knife in his right he first makes a vertical cut from 1 to 1¼ inch in length; then a horizontal cut directly across the top of the first cut, allowing the knife to press back, so that the bark is cut and slightly raised with the one operation. If the sap is flowing freely these two light cuts extending through the bark are all that is required. (For vertical and transverse cuts see illustration in lower corner, Fig. 1.)

We are now ready to cut the bud preparatory to inserting it in the stock. As the bud will have to be slipped downwards into the stock, we must cut it (the bud) from the scion or bud stick upwards, so as to leave the bottom portion of the bud in a perfectly smooth condition, in order that it will the more surely keep its proper shape while being forced down underneath the bark of the stock. It will be observed that the bark has not been loosened,

Fig. 1.—Making the cut in the stock.*

except when making the transverse cut, and then only sufficiently to allow the lower point of the bud to enter the bark, preparatory to being forced down with either knife or thumb.

* Note.—The operator is seen in the act of budding what are really budded stocks. No other plants of suitable size were available at the time the photograph was taken.

Cutting the Bud.—Holding the bud stick in the left hand, with the forefinger directly underneath the bud about to be severed (see Fig. 2), insert the knife blade half an inch below the bud, cutting through the bark into the wood, pass the knife under the bud, and bring it out about the same distance above it, thus severing the bud, with a thin slice of wood adhering to it, with the one clean, even cut. (See Fig. 3.) The stock is now held well back with the left hand, and the bud inserted with the right by first placing it in position and then forcing it down with the thumb or the blade of the budding-knife (see Fig. 4); where it can be seen embedded underneath the

Fig. 3.—The bud ready for insertion.

Fig. 2.—Showing how to hold the bud stick and cut out the bud.

bark of the stock and ready to be tied, for which purpose either raffia or waxed calico may be used. If raffia is to be used, it should be moistened before binding the bud with it, and care must be taken to see that the bud is securely tied and fastened, so that there is no danger of the wrapper loosening, else the chances are that the bud will not take. The tie should be bound tightly, and the bud will not be damaged in any way if it is completely covered; but if it is large it is as well to leave it slightly exposed.

If there is any reason to expect rain about the time of budding, it is best to use the waxed cloth, and by starting to wrap from below the bud and finishing at the top it can be so wrapped that very little moisture can find its way under the cloth. In cases where budding is done during the rainy

season, the buds may be put in so as to slip them up in place of downwards into the stock; the horizontal cut is then made at the bottom of the vertical cut (⊥), and thus there is less danger of the water getting near it. In fact, if the buds are well wrapped with waxed cloth, rain could not get near the bud or cut, as the waxed cloth would be a complete protection. If buds are loosely tied, water sometimes gets around them and turns them sour, and in this way they are killed. In wet climates, it is, therefore, as well to use the waxed wrappers altogether, when little, if any, loss will be found among the buds.

Fig. 4.—The bud in position, ready for tying up.

Fig. 5.—Showing how the bud is wrapped with waxed cloth.

Fig. 5 shows the appearance of the bud after wrapping with waxed cloth. It will rarely be found necessary to loosen or remove any of the wrappers within a fortnight after spring or summer budding, and, in the case of autumn budding, three to six weeks.

At the proper time, the stocks are cut back to within 6 inches of the bud, and when the latter grows out the young shoot may be tied to the stock above the bud. Keep all suckers off the stock, and allow only one shoot to grow from the bud. All laterals must be kept off the bud until it is at least 15 inches long.

In cases where spring and summer budding are practised, the tops of the stocks may be removed to within 6 inches of the bud (see Fig. 6), as soon as the buds are well set, or about three weeks after their insertion. For autumn, or dormant buds, the stock can be cut back in the winter, unless for citrus trees, in which case the tops may be removed in the spring, just as growth starts. Fig. 6 shows a dormant bud just starting into growth in the spring and not yet long enough to tie to the stock, which is seen projecting above the bud. Fig. 7 shows young bud shoot tied to stock.

Fig. 6.—A bud just starting into growth in Spring.

Fig. 7.—The bud shoot tied to the stock, which has been cut off as indicated.

A New Method of Budding.

Mr. J. Bell, of Balmain, having an old peach-tree which he had unsuccessfully tried to work on several occasions to a different variety, hit upon the plan of sharpening the handle of a tooth-brush and fitting this into a handle, the whole having the appearance of a strong awl. This instrument he drove underneath the bark to a depth of about 2 inches. After withdrawing it, he inserted scions carrying two or three buds, and then tacked a piece of wet leather over the base of the scion to keep it securely in its place, using ½-inch

Fig. 8.—Mr. Bell's system of budding. The scion fixed in position with a piece of leather.

enamelled nails. Both buds and grafts were treated in this way, and to Mr. Bell's delight, they all grew, and he now has a tree on which are growing several different varieties of peaches. Mr. Bell does not seem to have tried

this process on other trees; but, since seeing his tree, I have tried it on thin-barked trees, and find that it does not work nearly as well as on those with thick bark; in fact, in place of raising the bark on 8-year old apple, pear, and plum trees, it split the bark immediately the bone entered. From this I concluded that this method of budding and grafting is well adapted to trees with thick bark, such as the peach, but is of little value for thin-barked trees; but, as an old peach-tree is about the hardest thing to bud or graft without first cutting it back, in order to get young wood in which to bud, Mr. Bell's method will be of great assistance to those wishing to re-work old trees. It is so simple that any person can do it. (See Figs. 8 and 9.)

Fig. 9.—The growth from a bud worked by Mr. Bell.

Fig. 10.—Preparing waxed cloth.

Making Waxed Calico.

Secure a good, strong, cheap calico which will tear easily without fraying. Tear into strips varying in width from 8 to 15 inches, according to the size of the stocks to be budded or grafted. The strips should be wide enough to wrap around the stocks at least four or five times. Take three parts beeswax, three parts resin, two parts mutton tallow, and melt all up together, and while still hot, dip the calico into the mixture and draw it out between two straight-edged sticks held tightly together. These will remove all surplus wax and leave just enough on the calico. If it is found that this mixture is not quite sticky enough, a little more beeswax can be added. For ordinary budding, this waxed calico, after it is cool, may be doubled up and nicked along its edge at distances of about one-third of an inch. It is then unrolled and wound on a pointed stick, as shown on Fig. 11. After nicking, it is readily torn each time a small strip is required; and by winding it on a pointed stick the latter can be easily stuck into the ground, and the waxed cloth in this way is kept from contact with the dirt, and is always clean. In Fig. 11 it will be seen that the nicks show plainly along the top of the cloth. Without this nicking there would be difficulty in tearing the strips the proper width.

Fig. 11.—Showing how the waxed cloth is carried while in use.

Grafting will be dealt with in next issue.

(*To be continued.*)

Free Distribution of the "Agricultural Gazette."

Gratis recipients of the *Gazette* were asked to renew their applications for the publication on a form sent out with the November issue. As, up to date, quite a number have omitted to return the form, this opportunity is taken to remind them that should no communication be received from them by the end of January, it will be taken as an intimation that they do not desire to receive any further numbers of the *Gazette*.

Notes on some Exotic Grasses not previously recorded from New South Wales.

J. H. MAIDEN AND E. BETCHE.

1. Slender Fox-tail Grass (*Alopecurus agrestis*, L.).

Bathurst Experiment Farm, in a scarlet clover field, R. W. Peacock; October, 1910.

A common English annual grass, found in cornfields and waste ground. This grass is readily distinguished from the two species of *Alopecurus* already firmly established in New South Wales (*A. pratensis*, L., and *A. geniculatus*, L.), by the two outer glumes being united half-way up. It is not regarded in England as such a valuable grass as *A. pratensis*, and is rather reckoned as a weed, exhausting the strength of arable land to no purpose.

It can hardly be called yet naturalised in New South Wales—Mr. Peacock thinks it may have been sown with the clover seed—but as it is recorded by Professor Ewart as naturalised in Victoria, and by Mr. Rodway in Tasmania, we may well expect it to become also established in this State.

2. Paradoxical Canary-seed Grass (*Phalaris paradoxa*, L.).

Netley Station, Darling River, J. Dunn, through W. J. Allen; July, 1910. Wahroonga, E. Cheel; October, 1910.

This grass is in habit so much like *Phalaris minor* that it may be easily mistaken for it by an inattentive observer, even if they grow together in the same paddock, but the structure of the spikelets is very distinct. In *P. paradoxa* the outer glumes have long points, almost awns; the keel of the outer glumes bears on its back a horn-like wing; while the lower spikelets are sterile and deformed, and of a peculiar crinkled and crested appearance, from which character Linné gave it the name *paradoxa* about 150 years ago. In *P. minor* the outer glumes are much less pointed, the keel is extended into a narrow wing, and all spikelets are uniformly developed.

The grass was previously recorded in Australia only from Kangaroo Island, South Australia. It is a far cry from Kangaroo Island to the Darling River, but probably it will be found in other places if people will examine their *Phalaris* grasses more closely.

3. Brome Grass (*Bromus*, L.).

Australian climatic conditions seem to be specially favourable to the genus *Bromus*, as no other genus of grasses is represented in Australia by anything like so many naturalised species. Bentham mentions in the *Flora Australiensis* only three introduced species, apart from the indigenous *Bromus arenarius*, but we can now record fourteen species as more or less firmly established within the five Australian States.

NEW SOUTH WALES, all represented in the National Herbarium, Botanic Gardens, Sydney :—

1. *B. macrostachys*, Desf. "Large spiked Brome grass."
2. *B. madritensis*, L. "Madrid grass."
3. *B. maximus*, L. "Great Brome grass."
4. *B. mollis*, L. "Soft Brome grass."
5. *B. secalinus*, L. "Rye Brome grass."
6. *B. rubens*, L. "Red Brome grass."
7. *B. unioloides*, H.B. & K. "Prairie grass.'

All species have been either determined at Kew by Dr O. Stapf, or our determination is confirmed by that gentleman.

VICTORIA, from Professor Ewart's list of weeds of Victoria :—

1. *B. arvensis*, L. "Field Brome grass."
2. *B. asper*, Murray. "Rough Brome grass."
3. *B. inermis*, Leyss. "Hungarian Brome grass."
4. *B. madritensis*, L. "Compact Brome grass."
5. *B. mollis*, L. "Soft Brome grass."
6. *B. racemosus*, L. "Smooth Brome grass."
7. *B. scoparius*, L. "Mediterranean Brome grass."
8. *B. sterilis*, L. "Sterile Brome grass."
9. *B. unioloides*, H.B. & K. "Prairie grass."

SOUTH AUSTRALIA, from Mr. J. M. Black's "Naturalised Flora of South Australia":—

1. *B. madritensis*, L. "Madrid Brome grass."
2. *B. maximus*, L. "Great Brome grass."
3. *B. mollis*, L. "Soft Brome grass."
4. *B. rubens*, L. "Red Brome grass."
5. *B. sterilis*, L. "Barren Brome grass."
6. *B. unioloides*, L. "Prairie grass."

QUEENSLAND, from Mr. F. M. Bailey's "Queensland Flora":—

1. *B. sterilis*, L. "Barren Brome grass."
2. *B. unioloides*, H.B. & K. "Prairie grass."

TASMANIA, from Mr. L. Rodway's "Flora of Tasmania":—

1. *B. mollis*, L. "Soft Brome grass."
2. *B. sterilis*, L. "Barren Brome grass."
3. *B. unioloides*, H.B. & K. "Prairie grass."

WESTERN AUSTRALIA, from National Herbarium, Sydney :—

1. *B. maximus*, Desf. "Great Brome grass."
2. *B. mollis*, L. "Soft Brome grass."
3. *B. tectorum*, L.

No list of the West Australian weeds has been published as far as we know, and the three species we can give from the Herbarium are probably far short of the real number of species of *Bromus* introduced into West Australia. *B. tectorum* is not recorded from any other State.

It will be noticed that *B. sterilis* is not mentioned in our list of New South Wales species of *Bromus*, though Bentham recorded it from New South Wales, Victoria, and Tasmania in 1878, and though all other Australian botanists record it from their States. We find that all the New South Wales species formerly determined as *B. sterilis* are *B. maximus*. It seems that Bentham mistook *B. maximus* for *B. sterilis*, and his mistake misled most Australian botanists. Dr. Prain, Director of the Royal Botanic Gardens, Kew, informed us that the two Tasmanian specimens quoted by Bentham as *B. sterilis* are undoubtedly *B. maximus*. We cannot say whether the specimens from Victoria and New South Wales quoted by Bentham as *B. sterilis* are correctly determined or not, but we can say with certainty that we have no true *B. sterilis* from New South Wales in the National Herbarium, and that a specimen sent by Mr. Black from South Australia as *B. sterilis* is also *B. maximus*.

B. sterilis and *B. maximus* are both British grasses; they are closely allied, but quite distinct and easily distinguished.

B. sterilis has a lax panicle with long branches, and the spikelets are frequently pendulous. Glumes, 7–10 in the spikelet.

B. maximus has a panicle with shorter branches, and always erect, coarser spikelets. Glumes, 4–6 in the spikelet.

That such distinct grasses could have been mistaken for such a long time, shows how inconvenient are mistakes in standard books—people are much inclined to trust authorities without criticising. We and others took it for granted that Bentham's determination was right, and the mistake was perpetuated for thirty years.

It will be further noticed that out of the nine species reported as naturalised in Victoria, only three are mentioned from New South Wales, and that four species naturalised in New South Wales are not mentioned from Victoria. This seems strange, and shows that the introduced species of *Bromus* want a good deal more investigation. We should be glad if readers of the *Gazette* would send all kinds of Brome grasses met with on their runs or on their fields to the Botanic Gardens.

Since the above was in type we have received two Australian specimens of the true *Bromus sterilis*, one from the Hawkesbury Agricultural College, Richmond, New South Wales, and the other from Midland Junction, near Perth, Western Australia; we must, therefore, add this species to the introduced flora of Western Australia, and perhaps also to that of New South Wales. Though the specimen from Richmond was not cultivated, we can hardly regard a grass as naturalised if it has been found only near an Agricultural College, where escapes from cultivation are likely to be met with.

Manganese Causing Bare Patches in Soil.

In September, 1909, Mr. E. R. Hawke, secretary, Dubbo Bowling Club, forwarded sample of soil from a patch of the local Bowling Green on which the grass had died, as well as a sample from healthy soil alongside. On analysis in the Chemical Laboratory of the Department, the only appreciable difference to be found in the two soils was that the affected ground contained ·240 per cent. of oxide of manganese (as Mn_2O_3). As explained by Mr. Guthrie in the *Gazette* for May, 1910, page 437, salts of manganese in certain quantities are injurious to crops. Mr. Guthrie suggested, as an experiment, that superphosphate be added to the affected patches, as this might convert the manganese into a phosphate of manganese which might not be so toxic as the existing combination.

Mr. Hawke dressed the whole green, and more especially the patches where the grass had previously died, with superphosphate a couple of times during the summer months, and just before the frosts commenced gave it another dressing containing a slightly higher percentage of superphosphate. During the summer months the grass always thrives; the trouble had hitherto occurred in winter. During last winter the green fared very much better than during the previous one. In certain patches the grass showed a tendency to die off, but in not one patch did it actually die, whereas at the same time the previous year there were large patches in the green where the grass had completely died.

Mr. Hawke put a light dressing on about the end of September, and the grass responded at once. The grass is still slightly thinner where the old patches were, but Mr. Hawke is confident that in a little while those portions will be as thickly covered as the rest of the green.

Improvement of Wisconsin Horses.

In Bulletin 186 of the Agricultural Experiment Station of the University of Wisconsin. Dr. A. S. Alexander, V.S., states that the average value of the horses in Winconsin has increased 15 dollars per head during the past three years, "doubtless due in some degree to the influence of the stallion law which went into effect 1st January, 1906." The law, as now in force in that State, requires the licensing of all stallions offered for public service, the certificates providing that the horses are free from hereditary, contagious, or transmissible unsoundness or disease, and dividing them, according to breeding, into five classes—Pure-bred, Cross-bred, Non-standard bred, Grade, and Mongrel or Scrub. The certificate for the last-named class states that the stallion is certified as sound, but is of *mongrel breeding,* and therefore *not eligible to registry* in any stud-book recognised by the Department of Agriculture, Washington, D.C.

Dr. Alexander advocates "grading up," and quotes Davenport's figures to show that, by the use of a pure-bred stallion of the same breed for five successive crosses, the resultant offspring will be only 1·5 per cent. unimproved, or practically pure-bred.

A pure-bred stallion must be used for each cross if a grade is to be produced and final purity of blood attained. No grade can be produced by using a "Cross-bred," "Non-standard Bred," "Grade," or "Mongrel or Scrub" stallion; nor can progress towards eventual purity of blood be made by using a pure-bred stallion of different breed for each cross or an occasional cross. "Grading up" means using a pure-bred stallion for the first cross and continually crossing the resultant female progeny with pure-bred stallions of the breed first used until all impure blood has been practically bred out.

Every stallion should be worked—

The stallion that is to beget work horses should be capable of doing the work that will be required of his offspring. He should be worked or abundantly exercised, and be fed like a work horse. . . . *Blubber is the bane of the business.* . . . *Render out the fat by work.* Substitute hard muscle by labour and out-door exercise.

The value of a pure-bred or high-grade breeding mare is also emphasised, but the necessity of using only pure-bred stallions is rendered apparent by photographs of a standard-bred mare, "Anna McGregor," and her two fillies by a grade shire stallion. The fillies show the true characteristics of their dam, but none of the grade shire type of their sire. Prepotency depends upon purity of breeding, and may be possessed by either sire or dam. The sire always should be pure-bred.

The Purification of Muddy Waters.

In a recent issue of the Journal of the Department of Agriculture of Victoria, Mr. A. C. H. Rothera, M.A., M.R.C.S., Lecturer in Bio-Chemistry, Melbourne University, gives results of some experiments made with chemicals to precipitate the impurities contained in rain-water stored in open tanks, with puddled clay embankments and floors. The effect of the addition of certain chemicals is to cause the minute particles of silt to collect into large, flocculent masses, when they settle to the bottom. The bulky flocculi enclose and carry down the micro-organisms present at the time, as well as such dangerous contents as the eggs of hydatids, leaving the water bacterially pure. Only actively swimming water *Crustaceæ* escape, and these do not live long in the clear water, owing to absence of food supply. The water is also left chemically pure, as the chemical added separates with the precipitate.

Combining cheapness with chemical efficiency, Mr. Rothera states that the only chemicals which need be considered are alum, chloride of iron, and lime. Lime is only considered on account of cheapness, as it is not nearly so "brilliant" in its action as either alum or chloride of iron; still it is practical.

Alum is cheaper than chloride of iron, but weight for weight 1 lb. of chloride of iron is worth 2 lb. of alum.

Chloride of iron is very efficient in causing the mud to settle; easily soluble, and not only harmless, but a most valuable mineral constituent for all animals; so that there is a distinct gain, even if too much is added so that it is not all thrown down with the mud.

This "ideal" chemical should be on the market as cheaply as possible. In Germany it is sold at 2½d. per lb., and Mr. Rothera considers that the price doubled would leave it cheap for clearing water.

Experiments with chloride of iron were made upon water in tanks, and also in open dams. In a cylindrical tank, containing 600 gallons of muddy pond water, ½ lb. of chloride of iron, previously dissolved in a little water, was found to deposit all the silt in sixteen and a half hours, leaving the water near the bottom of the tank clearer than the Melbourne water supply from Yan Yean. An open waterhole, containing 1,000 gallons of thick, dirty muddy water, was perfectly cleared in one night with 1 lb. of iron chloride. In another test a waterhole, containing 1,800 or 1,900 gallons of water, was cleared in five hours with 2 lb. of chloride of iron. The solution in this case was diluted and thrown over the water as evenly as possible, and the surface layers gently stirred with a long pole, so as to ensure regular distribution of the chemical.

This information should be of considerable value to stock-owners, butter factory managers, and others who need clean water.

THE WORLD'S WOOL.

THE following figures show the estimated wool clip of the world, those of Australasia being for the year 1908, and those of the rest of the world for 1906. These are the latest figures available in each case :—

	lb.
AUSTRALASIA—	
New South Wales	344,551,000
Queensland	115,283,000
Victoria	93,999,000
South Australia	52,041,000
West Australia	22,451,000
Tasmania	13,860,000
Commonwealth	642,185,000
New Zealand	200,547,000
SOUTH AMERICA—	
Argentine	328,731,000
Other	107,985,000
EUROPE—	
Russia	320,000,000
United Kingdom	133,088,000
France	78,000,000
Other	273,200,000
NORTH AMERICA—	
United States	298,915,000
Other	19,833,000
ASIA—	
Russia	60,000,000
British India	50,000,000
Turkey	45,000,000
China	42,253,000
Other	13,146,000
AFRICA—	
South Africa	89,783,000
Algeria	33,184,000
Other	16,735,000
Grand Total	2,752,585,000

On this basis, the principal wool-producing countries are :—

1st.—Australia	642,185,000	23·4	per cent.
2nd.—Russian Empire	380,000,000	13·8	,,
3rd.—Argentine	328,731,000	11·9	,,
4th.—United States	298,915,000	10·9	,,
5th.—New Zealand	200,547,000	7·3	,,
6th.—United Kingdom	133,088,000	4·8	,,
7th.—All other	769,119,000	27·9	,,
Total	2,752,585,000	100·0	,,

—W. H. P. CHERRY.

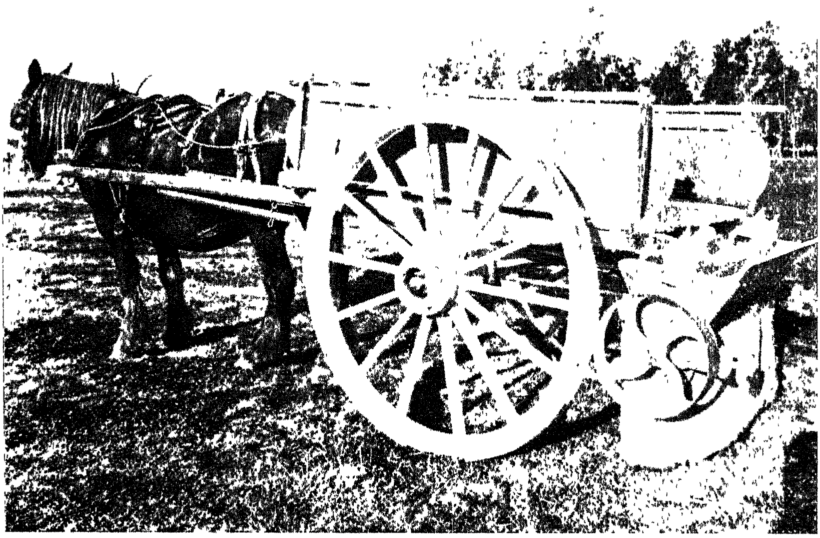


Fig. 2.—Kerle's Lime Distributor, with bag screen to prevent lime being carried away by light breezes.

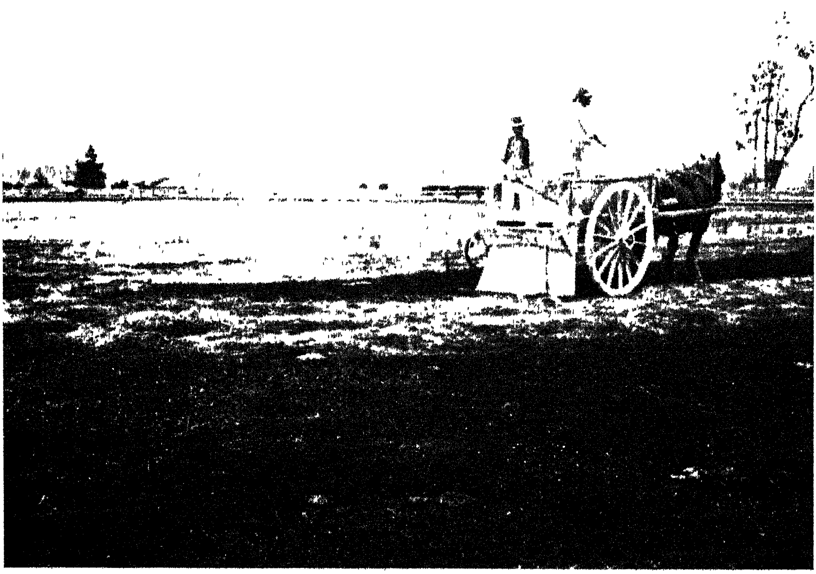


Fig. 3.—Kerle's Lime Distributor on Mr. A. Perrett's paddock, Jones Island, Manning River; showing portion of 6 acres limed.

A Lime Distributor.

G. MARKS, Inspector of Agriculture.

On the 12th and 13th August an area of 6 acres of pasture, the property of Mr. A. Perrett, Jones Island, Manning River, was top-dressed with fresh air-slaked lime, supplied by the Manning Lime Company from their Chatham quarries. Advantage was taken of the opportunity to test a distributor designed by Mr. Kerle, of Taree.

It consists of a V-shaped hopper, which can be fastened to the back of any ordinary dray. A pulley is attached to one end of a spindle, which runs the full length of the hopper, and this pulley is driven directly from the tyre of the dray-wheel. The hopper is secured to the back of the dray by movable bolts, and kept in position by two iron rods which pass from the hopper, underneath the body of the dray, to the axle. A short spiral spring keeps the pulley firmly pressed against the wheel, and this can be regulated as desired by means of a screw. An iron plate, extending the full length of the hopper, may be lowered or raised by means of screws, so as to reduce or increase the opening immediately over the spindle. The spindle, in rotating, feeds the lime through this opening.

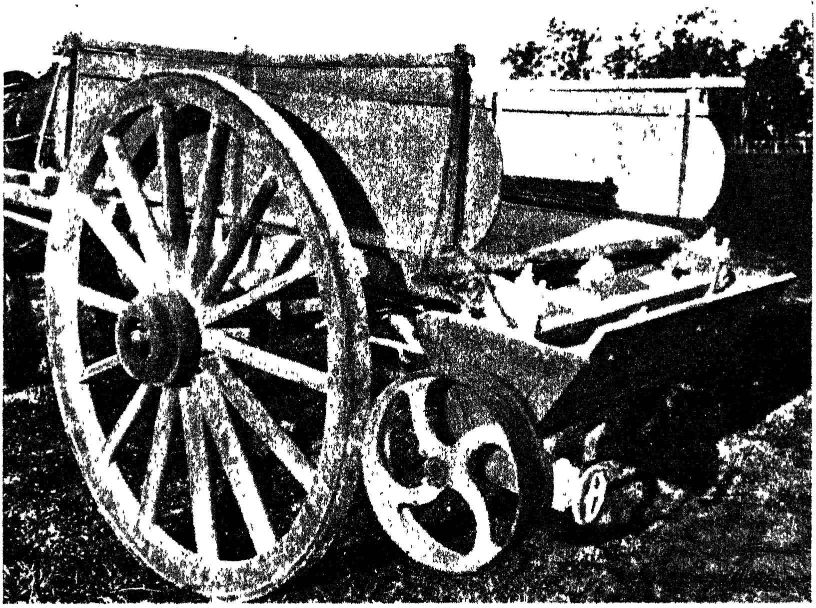


Fig. 1.—Kerle's Lime Distributor, attached to dray.

The lime is placed in the dray, and fed so as to keep the hopper about half full. No difficulty was experienced in applying the required amount, viz., 5 cwt. per acre. It was found necessary to clear away small pieces of unslaked lime from time to time, but this was speedily overcome by using a screen. To prevent as far as possible any lime being carried away by light breezes, a bag screen was attached to the bottom of the hopper, and the lime was thus conveyed to the ground with practically no waste.

As a result of the trial several mechanical defects were noticed, and these Mr. Kerle intends to remedy in a new machine which he is making; but altogether the trial was very satisfactory.

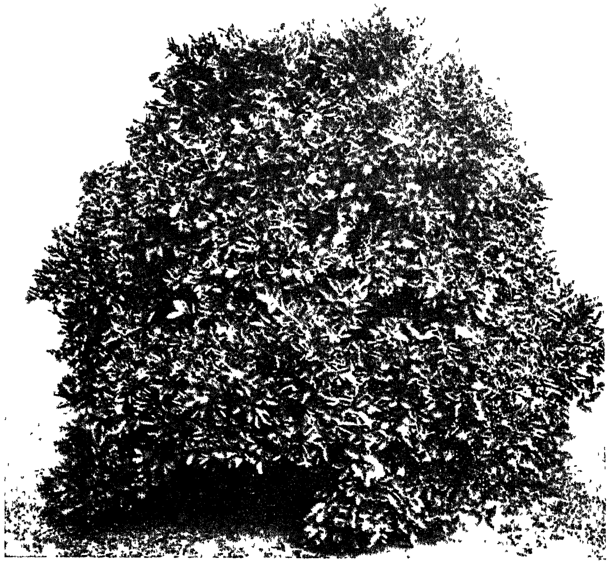
Navel Mandarin.

About eighteen years ago Mr. Walter E. Coates, of St. Ives, obtained a Scarlet Mandarin from the Manning River, from which he saved the seeds, and raised six trees, one of which proved to be a Navel. The tree grew well, but apparently for some years did not prove to be a sufficiently heavy cropper to warrant working many trees to this variety. It was found, however, that the worked trees bore better crops while young than did the parent tree, and Mr. William Smith has about seventeen fine six-year-old trees of this variety—all looking the picture of health, and carrying from two to three cases of fruit each. The tree resembles the Scarlet, is quite as strong a grower, and is much more robust than other Mandarin trees. The fruit usually hangs well, and retains its condition much better than other Mandarins, inasmuch as it does not become so puffy when allowed to hang late, nor does it lose much of its juice by keeping. As a matter of fact, it is said to improve in flavour if kept until about November, and Mr. Smith says he has no trouble then in obtaining 20s. per case for all he grows.

Mr. Cater evidently thinks more of the Late Valencia than of the Navel Mandarin, as, in planting a large orchard, the majority of the trees planted were Late Valencias.

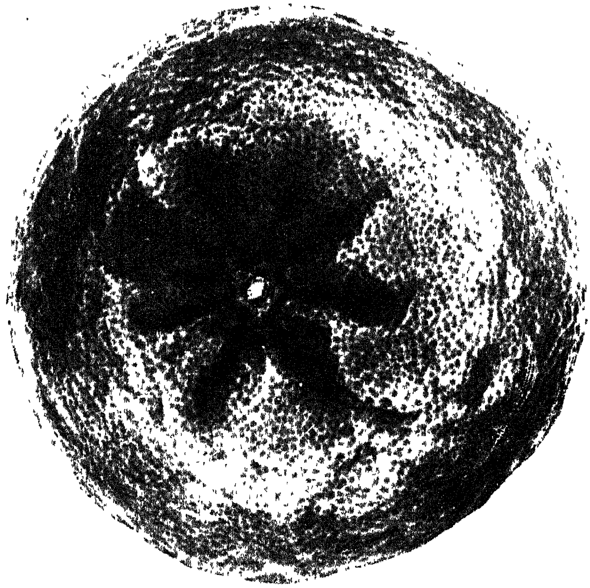
I do not consider that we yet know enough about this variety (the Navel Mandarin) to warrant growers in planting many trees; but I certainly think it would be worth while for the intending planter to put in a few trees, in order to test it in his soil and district. I imagine it would not prove such a good keeper if grown on low levels or in warm districts, but this of course remains to be proved.

The fruit averages between $2\frac{3}{4}$ and 3 inches in diameter, by about 2 inches. Each Mandarin contains about fifteen sections, and each section contains from one to two seeds, most of which are abortive. Rind thin—less than one-eighth of an inch thick—fruit, juicy, and sub-acid.—W. J. Allen.

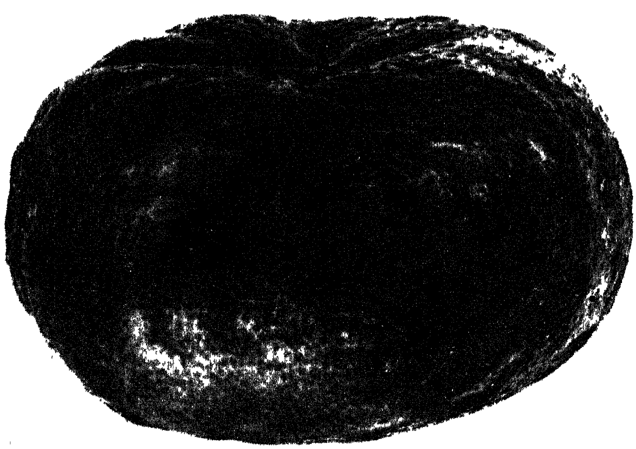


Navel Mandarin Tree.

Navel Mandarin—Calyx end.



Navel Mandarin—Stem end.



Navel Mandarin—Side view.

The Problem of Sex in Eggs and Chickens.

GEORGE BRADSHAW.

FROM time immemorial man has been endeavouring to solve the problem of foretelling what sex is contained within the shell of a fertile egg. Aristotle, 350 years B.C., discussed the problem; Pliny, the elder, advanced theories on the subject; while the father of agriculture, Columella, in his Eighth Book, deals largely with poultry management, and says :—

> The best time to set a hen is when the moon is increasing, from the tenth to the fifteenth. If all males are desired, set only the pointed eggs; if all females, set the rounded ones.

Although the above would scarcely be accepted now as orthodox, still Columella advocated methods of management adopted at the present time. The Hawkesbury Agricultural College authorities are experimenting to see if it pays to keep three-year-old hens, and, from appearances, the results will probably confirm what Columella remarked two thousand years ago:—

> Also dispose of all old hens, for after three years they become unfruitful.

Regarding the problem of sex, from the time of these early writers, right through history, down to this year of 1911, nearly every naturalist has touched on the subject, while the majority of specialists in feathered life have hazarded opinions on the matter. With some writers, theories give place to dogma, the contour of the egg, or other circumstances, being the only warrant for their predictions as to the sex of the unhatched chicken. Eggs long and thin have been described as those which will produce cockerels, the short dumpy ones pullets. Some writers maintained that an egg laid before noon was responsible for a certain sex; the afternoon-laid egg being of the opposite.

Another theory which had votaries was that a new-laid egg would hatch out a cockerel, but that if not placed under the hen till the fourth or fifth day, a pullet would result. Still another, though less popular, idea was connected with the position of the eggs in the nest. Should the end point south, it meant a pullet, but if north, a cockerel. This would be very convenient for the poultry-keeper, who would only have to go round the nests compass in hand, and return with so many cockerel eggs and a certain number of pullets. Many other methods of discovering sex have been advocated, and even experiments with the X-rays, and other media, have been tried, with the idea of gaining some clue as to whether sex could be foretold.

The above opinions and theories, however, all paled into insignificance in March, 1909, when at the invitation of a Mr. Williams, the editors of several English poultry journals, Mr. W. T. Stead, and others, met at the "Hotel

Cecil," London, to witness a demonstration of the work of a little instrument invented by Mr. Williams, who claimed that by its action the sex of any animal could be told: that it could accurately tell the sex of the chicken within the egg, and also whether an egg was fertile or not.

The instrument was simply a small pith ball suspended at the end of a magnetised steel or copper wire, with a handle at the other end. The instrument was held over rabbits, mice, fowls, &c.; and when held over a male animal the ball rotated steadily, but when placed over a female it swung backward and forward—pendulum-fashion.

The same motions were produced over some eggs, and over others the ball would not move. The latter were said to be infertile. One or two of the visitors were satisfied at the demonstration; some expressed doubt, but all went away wondering.

Eggs, however, were taken by some of the parties to hatch, and reports of the results were eventually to be published.

It is needless to say the reputed discovery got full ventilation in the English poultry papers, many breeders describing the claim as absurd, while others as warmly testified to its reliability.

The instrument, however, had not the field long to itself, for in a few weeks a correspondent wrote to one of the poultry papers, that the motions of the pith ball over an egg, and like results, could be had with a darning-needle attached to a silk thread. This statement excited a section of the poultry-breeders still more, and before long scores of letters appeared, some describing both the instrument and the needle a fraud, others as certain as to the correctness of the indications.

In the correspondence in the press, disputations occurred as to which sex was represented by the revolving movement and which by the pendulum swing; one writer asserting that he had suspended the instrument over the heads of his son and daughter and noted results. Preliminary announcements of demonstrations were freely made, but unfortunately the writers did not publish the results.

The following letter is one of many which were published about the same time, from writers who regarded the whole matter as ridiculous:—

Sir,—It is surprising what an amount of credulity exists in the world. Someone comes along with a brand new idea of telling the sex of eggs, and immediately staid and respectable poultry-farmers sally forth with thread and darning needle (surreptitiously taken, most probably, from the wife's work-basket), and chase squawking chicks frantically round the pens bent on determining their sex. This is foolish enough, but when it is gravely asserted that the power of the pendulum extends to the egg, then the situation becomes ludicrous. Any student of embryology will tell the talented inventor of this method: that for the first few days the chicken in embryo is asexual, and on the seventh day distinctly hermaphroditic—containing within itself elementary organs pertaining to both sexes. After this stage it verges in one direction or another, one set of organs diminishing as the other increases. It will be seen that the merest accident determines the future of the bird, the nutritive values obtainable from the pabulum reacting constitutionally or otherwise on the growing organs of sex. Thus, since the germ of life can have no sexual attributes, it is obvious that the pendulum theory falls to the ground.

Doubtless, the fact of a swinging motion being imparted at all to the needle is due to subconscious nervous vibration. In automatic writing—which mediums assert is produced by the activity of an outside influence using their hands for the purpose of writing a variety of ideas—this phenomenon is observed. Apart from an acceptance of spiritualistic nostrums, one must admit that the writings are produced entirely unconsciously—that the mind of the writer is, at the time, a blank. But now comes the point. The subconscious mind receives the impression and transmutes it, so that the brain is forced to act, albeit, unconsciously, so that it generally resolves that a man's will is the determining factor, and if he settled in his mind that a rotary motion indicated cockerels, whether he actually desired, or *vice versâ*, masculine birds, a rotary motion would be imparted to the suspended needle. The swing of the pendulum would be entirely dependent on the strength of his desire or will.

In conclusion, may I advise that the needles be once more returned to the household socks, and amateur attempts to pry into Nature's secrets suspended *sine die*.—Ernest W. Boxall.

Mr. Foster, the writer of one of the letters, carried out his offer of presenting a couple of settings of eggs which had been tested by the "sexaphone" to prove its reliability, the following letter being the only thing ever heard of them afterwards :—

Again, I should like to ask Messrs. Harlow and Davies for the report which they promised us as to the results from the eggs supplied them by Mr. Foster, and also the report as to the pullets' eggs which Mr. Foster said he would report. These birds being now twelve weeks old and Harlow and Davies' nine weeks, surely it is time that we heard something, considering the noise made about them. I am afraid that these gentleman have resolved in combination to be silent, because the bubble has burst, which every sensible man expected. Are they ashamed to own up and undo that superstition which has been created in the minds of many simple people ? Let them make a supreme effort to tell us the exact truth about the matter. We shall not see them blush, nor will they hear the laughter.

Over a year had now elapsed from the meeting at the "Hotel Cecil," and another was held at the *Review of Reviews* office, when eggs were distributed to several visitors, who were to report on them. The following editorial notice, which appeared in one of the London poultry journals a short time ago, was the response :—

About a year ago we gave some particulars in this column of a gathering of poultry-keepers at the office of the *Review of Reviews*, to witness a demonstration of an instrument called the "sexaphone," which, the inventor claimed, was able to forecast the sex of the embryo before the egg was hatched. A number of eggs and day-old chickens were tested at the meeting, and those present were allowed to manipulate the instrument, with the result that contradictory verdicts were given upon the same object. Mr. Edward Brown, F.L.S., took a number of eggs and chickens, and Mr. W. M. Elkington also took some eggs, which were duly marked and hatched. A report was to have been published upon the result of these tests, but we gather that no public statement has been made because the inventor has declared that the machines were not in proper working order. That manipulated by the inventor, Mr. Williams, himself, gave varied results in the hands of other persons ; but for all that, we understand that among Mr. Brown's eggs over 70 per cent. of the predictions were correct, and among the chickens over 80 per cent. were correctly marked. Mr. Elkington's eggs were tested at the same time by Mr. Williams' assistant, and only a small percentage of the predictions were correct ; but we now learn that this instrument was not made by the inventor, and that it was not to be depended upon. These explanations, we think, might have been made at the time, and many people will, no doubt, regard them as unsatisfactory. But the comparative success of Mr. Brown's test suggests the desirability of a further test, and we understand that more eggs are to be "sexaphoned" and put down this season.

The sum and substance of the above explanation is the very general one that something has gone wrong with the works, and with this communication ended, perhaps, a not unprofitable discussion, but still leaving foretelling the sex as it was in Columella's time : "If you want cockerels set the thin eggs,

and for pullets the short ones," which is just as reliable as that claimed for what was called the most marvellous scientific invention of the century.

When the above disputations and discussions were going on, an instrument of the same name was introduced to Sydney. Whether it was an Australian discovery or an importation the six-paged pamphlet did not say, but certainly the claims were considerably greater than those made for the English article, the extraordinary one being that the human mother, by its application, could foretell the sex of her unborn child.

At any rate one suburban grocer had absolute faith regarding its reliability, for during the 1909 hatching season he displayed the following on a board outside his door:—"Leghorn eggs for hatching. Cockerels or pullets as desired." The following directions were issued :—

Directions for Using the Sexaphone.

Hold the ring firmly between the thumb and forefinger with the metal globe suspended about an inch above the egg to be tested. Start the sexaphone with a very gentle swing, and, if the sex of the egg is female, the globe will begin gradually to swing with a circular motion, but if the sex of the egg is male the globe will swing in a straight line across the egg. This rule never varies, and it operates also in the same way when tried over any other form of animal life.

It is important that the hand should be kept very steady when holding the sexaphone, as the slightest movement interferes with the swing of the instrument.

Never hold an egg in your hand when testing it, as the magnetism from that hand will influence the instrument.

Eggs that are stale or unfertile will not give any results when tested.

If your magnetism is not strong you will obtain better results by heating the globe in boiling water or at the fire before use.

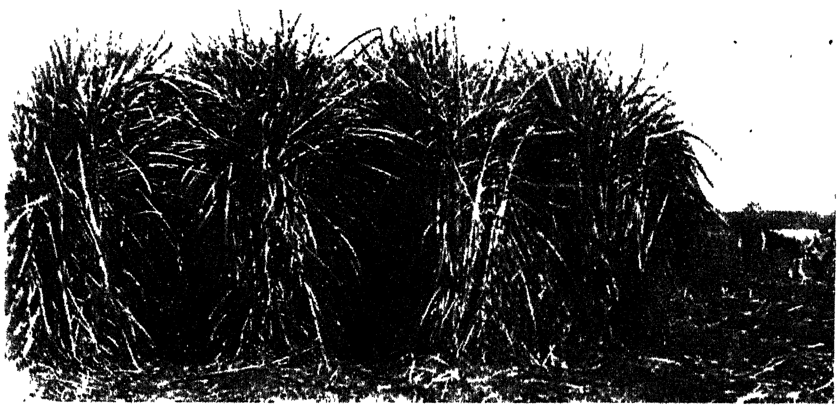
It will be seen that, as in the English article, the pendulum-like motion denotes one sex, a circular motion the other sex, which makes one wonder what pranks the thing would play over a double-yolked egg which contained a bird of each sex.

In conclusion, it may be briefly said that, should science ever triumph to the extent of bringing the sex problem outside the region of speculation, such will not be through an asexual egg, but more likely through beings who can think, speak, and reason. But should such a discovery ever be made the consequences would be too terrible to contemplate.

Indian Cane as a Fodder and Stand-by.

A. H. HAYWOOD, Manager, Grafton Experiment Farm.

ATTENTION was drawn by me to the merits of Indian cane as a fodder for stock in an article which appeared in the *Gazette* for October, 1908; Vol. XIX, Part 10. Since then the cane has been largely distributed, and has now had a fair test by the farmers in various districts, and under varying conditions of soil and climate; and it will be seen by the following abbreviated reports received from growers in different centres that it is unanimously recommended. The reports also show that the cane has a wider range of adaptability than is generally supposed. It is now grown successfully in the Kyogle, Casino, Lismore, Tweed, Clarence, and Upper Clarence districts, and as far south as the Lower Manning River.



Twelve months' growth of Indian cane, Grafton Experiment Farm.

In the previous article I stated that it was probably first introduced to Australia by the Colonial Sugar Refining Company, but information has since been supplied by Messrs. McInnes Bros., of Ashby Island, Clarence River, to the effect that they were instrumental in introducing it under the following circumstances:—About twelve years ago an Indian employee named Omrah Chand told Mr Innes that they grew cane in India that would grow higher in twelve months than China cane would in two years. Chand was asked to procure some plants, and he wrote home and had two plants of the variety sent out by post. These upon arrival here were very dry, but were soaked in limewater for a night before planting, and subsequently grew.

Mr. F. B. Guthrie, Chemist of the Department, has just completed an analysis of a sample of Indian cane, twelve months old, grown on the volcanic soil of the Grafton Experiment Farm. His report is as follows :—

Analysis of sample of Indian Cane.

Moisture	69·00	per cent.
Ash	11·04	,,
Fibre	6·84	,,
Albuminoids	2·25	,,
Carbohydrates	10·08	,,
Ether extract (fat or oil)	0·19	,,
	100·00	
Nutritive value		12·75
Albuminoid ratio		1 to 4·6

Mr. J. Campbell, manager of Yulgilbar Station, writes :—

After some forty years' practical experience in fodder-growing I consider this cane miles ahead of anything else I have tried before ; the greatest advantages being, that you can cut it when you require it, and, secondly, the enormous yield. I estimate the yield of my crop at 56½ tons per acre.

Mr. Campbell points out that the land received 30 tons of stable and sheep manure per acre ; and this, together with proper cultivation, and a favourable season, accounts for the enormous yield.

Mr. J. J. Heffernan, of "Cedar Grove," Kyogle, has a very high opinion of Indian cane as a fodder for stock, and feels sure that when it becomes better known, few farmers on the North Coast will be without an acre or two. As a frost and drought-resister it is superior to any of the sorghums, and will produce a greater tonnage per acre. The first year's growth averaged 20 tons per acre, and remained green all the winter. He prefers to cut every year's growth, as the canes are softer than when allowed to grow for two years or more.

Mr. H. W. Burton Bradley, "Sherwood," Lower Manning River, writes :—

It appears to suit the locality very well. As a winter feed it is for many reasons superior to sorghums and maize, standing, on the high lands, a fair amount of frost, which, up to the present, has only cut the outer leaves, having no effect on the sweetness and succulence of the stalk. As a feed it has good fattening properties, keeping the stock in fine condition throughout the cold weather, when otherwise they would fall off. By the use of this cane in the winter we are able to take full advantage of the abundance of grass in the spring without the loss of time usually experienced whilst the cows are putting on condition, to the usual accompaniment of scours, &c. Another point in its favour is, that it produces a larger amount of relishable fodder from a given area than any other crop, and also lasts a number of years without replanting.

Mr. John Wingfield, of Ulmarra, writes :—

I grow it on very poor sandy soil, and I find that the best stage for cutting for fodder is from ten to twelve months old. I feed it during winter when the cows are not in full milk, and they milk fairly well on it. It is very fattening for calves, when put through the chaff-cutter. It is a very hardy plant, and will stand the drought well if well

cultivated. I know of no other fodder equal to it. I always have the best of cream when the cows are fed on this cane. I have now on my farm 4 acres, and think it would average at the rate of 25 tons per acre.

Mr. A. Warrington, manager of the Aborigines Station, near Grafton, has a very fine plot of Indian cane, and has been using it all the winter. As a result his seventy-five head of station cattle are all in excellent condition. The labour of feeding it out daily takes one man two hours. His yield he estimates at between 30 and 40 tons per acre, and the year has been the first that he has not lost stock.

Mr. Norman Macleod, of Ulmarra, who was one of the first to grow Indian cane in this district, says:—

I have always found it satisfactory. It will resist frost better than any other variety I know of. I find it is quite as good as Imphee at its best. I know of no other stand-by to equal it. If chaffed it will fatten calves, and they prefer it to the best lucerne chaff.

Personal observation and tests on this Farm during the past three years verify most of the statements made herein, and the merits of Indian cane have not been overrated. To every stockowner of any portion of the North Coast to which it is adapted, I can confidently recommend it, as by its introduction no loss of stock need be feared during the hard winters and dry spells.

Agricultural Bureau of New South Wales.

BRANCHES of the Agricultural Bureau have, so far, been formed in eleven districts, and should there be any readers of the *Agricultural Gazette* who desire to join their local branch, they are invited to forward their names to the Hon. Secretary.

The Department will be glad to hear from persons who would be willing to form branches in other districts.

Alumny and Carr's Creek.

HON. SECRETARY ... Mr. A. R. Wetherspoon, Alumny Creek, Grafton.

Casino.

CHAIRMAN ... ... Mr. J. T. Junor.
HON. SECRETARY ... Mr. D. J. McAuliffe, Casino.
NO. OF MEMBERS ... Twenty-five.

Cundletown.

CHAIRMAN ... ... Mr. S. A. Levick.
HON. SECRETARY ... Mr. C. Eedy, Cundletown.
MEETINGS ... ... Wednesday on or before full moon.
NO. OF MEMBERS ... Twenty-three. Subscription, 3s. per annum.

At meeting held on 18th October, Mr. C. Eedy read a paper on *Lucerne*, dealing with the cultivation and general value of that crop. A discussion followed, particularly relating to Dodder and remedies; the use of the spading harrow after mowing; application of lime to the soil, &c.

At meeting held on 21st November, the subjects discussed were:—

Black Scour in calves.—Mr. P. Carl recommended that green gum leaves be thrown into the drinking water.

Insects attacking Pumpkin Vines.—Mr. Carl found that throwing sawdust on the leaves checks the attacks of insects considerably.

Old Hay.—Mr. H. Allan recommended, to make old hay more palatable to cows, that three kerosene tinfuls of hot water be poured over about 6 cwt. of the hay.

Inverell.

HON. SECRETARY ... Mr. W. A. Koak, Rock Mount, Inverell.

Little Plain.

CHAIRMAN ... ... Mr. W. White.
HON. SECRETARY ... Mr. H. C. Stening, Little Plain, *via* Inverell.
MEETINGS ... ... Thursday evening on or preceding the night of full moon.
NO. OF MEMBERS ... Twenty-one. Subscription, 2s. 6d. per annum.

At meeting held in November, after preliminary business, a discussion occurred upon the best means to be adopted for the eradication of Black Oats. Several members volunteered to read papers at the next meeting.

Peak Hill.

HON. SECRETARY ... Mr. A. B. Pettigrew, Peak Hill.

Stockinbingal.

CHAIRMAN ... ... Mr. A. Gilmour.
HON. SECRETARY ... Mr. J. Neville.
NO. OF MEMBERS ... Twenty-seven. Annual subscription, 2s. 6d.

At a meeting held on the 9th November, Mr. M. Attenborough read a paper on *Hay-cutting, Stacking,* and *Stooking,* describing the methods adopted by him.

Mr. Attenborough has supplied the Department with a photograph of two stacks built by him for Mr. W. H. Robinson, of Gobbagumbalin. The paper and photograph will be published in next issue of the *Gazette.*

Trundle.

CHAIRMAN ... ... Mr. F. A. S. Field.
HON. SECRETARY ... Mr. J. A. Porter, Trundle.
MEETINGS ... ... The first Saturday in each month at 3 p.m.
NO. OF MEMBERS ... Twenty-three. Subscription, 1s. per annum.

At a meeting held on 5th November, 1910, a paper was read by Mr. H. Allez on *Clean Farming.* As Mr. Allez sells his wheat for seed purposes at a high price, his recommendations are valuable. He considers that a farmer should keep his paddocks clean of wild oats, barley, drake, canary grass, and other strangers whose seeds will show in the wheat, and that it will pay him to do so. Start with clean ground, and keep it clean. Feed working horses on clean feed—many grains will grow after passing through a horse. But wild oats will still come in, particularly if the neighbours' paddocks are dirty. When the wheat comes into ear, go through it carefully and pull out all noxious strangers by the roots, and cart them away. Repeat this in ten days' time to catch the later oats. This picking is a trade; the picker should look around in all directions, as the rubbish does not show in all lights, and he should aim at gathering oats—not at covering ground. Even then, in land continuously cultivated, the oats will win. Before they get too thick the land should be spelled, and cultivated lightly to germinate the oats, which should then be fed down closely and not allowed to seed. Harvesting machinery should be clean, and seed should be placed in clean bags.

An interesting discussion followed the paper.

Wagga.

CHAIRMAN ... ... Mr. E. Crouch.
HON. SECRETARY ... Mr. J. Halloran, Wagga.
NO. OF MEMBERS ... Twenty-seven. Annual subscription, 1s.

A meeting was held on 21st October, 1910, to inaugurate the branch.

Walla Walla.

CHAIRMAN ... ... Mr. J. Wenke.
HON. SECRETARY ... Mr. H. Smith, Walla Walla.
NO. OF MEMBERS ... Twenty-five. Subscription, 1s. per annum.

At the meeting held in November, a paper on *Sheep Farming* was read by Mr. H. Peach, and one on *My Methods of Growing Wheat,* by Mr. W. M. Odewahn.

Mr. Odewahn fallows 50 per cent. of the land to be cropped the following year. He ploughs, about 1st August, a furrow 9 inches wide and 4 inches deep, and draws a harrow beside the plough. He considers harrowing immediately after ploughing preferable to harrowing at the beginning of summer, as the weeds run up more quickly, a better surface is formed, and the land works up better later on. He does not deem it necessary, in that district, to work the land after every rain to conserve moisture, as is recommended for

dry localities. He depends upon his sheep to keep weeds down, and very rarely gives the land more than one stroke of the harrow. At sowing time he works the land with a scarifier and sows at once.

Autumn ploughing is commenced as soon after 1st March as the land is in order. It is harrowed well to pack it, and seed sown about 12th April, using 40 to 50 lb. seed and 50 lb. superphosphate per acre. The late-maturing wheats are sown first. He does not harrow after the drill, as it makes too even a surface, and tends to consolidate the land too much.

Walli.

CHAIRMAN	Mr. C. T. Allen.
HON. SECRETARY ...	Mr. A. V. Bloomfield, Walli.
NO. OF MEMBERS ...	Twenty-two. Annual subscription, 2s. 6d.

SPRAYING FOR IRISH BLIGHT.

AN instance of the value of spraying with Bordeaux mixture to check the spread of Irish Blight (*Phytophthora infestans*) in potatoes, is related by Mr. Luke Gallard, Inspector under the Fruit Pests Act. Early in November, 1909, when the blight was spreading in the Narara district, Mr. G. Dun had a plot of potatoes about 3 acres in extent, comprising 2¼ acres of Brownell's Beauty, and ¾ acre Early Rose. Mr. Gallard arranged with Mr. Dun to have the plot sprayed as an experiment. On the 4th November, when the spraying commenced, the blight had a good hold of the Early Rose, which were more forward, and had just started in the Brownell's in four different places, having only spread about 8 or 9 feet around each centre. The Brownell's were just coming into flower.

The Bordeaux mixture was made in the proportions of 6 lb. bluestone, 4 lb. lime, and 40 gallons water. A large spray pump holding 100 gallons was used, worked with upturned nozzles, and drawn by two horses. Two rows on either side of the dray could be sprayed; so that two men and a boy could spray four rows at each turn.

The Brownell's Beauties were left to die down naturally, and when dug produced the best lot of tubers which Mr. Gallard has seen anywhere in the district. The infection had only spread about a rod around each centre, and even there had not reached the tubers to any great extent. The Early Rose potatoes suffered a little more, as the blight had a fair hold of them at the start. They also suffered considerably from Leaf Spot (*Alternaria solani*) and Dry Rot (*Fusarium solani*). The latter in the early stages did more harm than the Irish Blight did afterwards.

Mr. Dun gave the cost of materials (114 lb. bluestone and 76 lb. lime) including freight, as £2 1s. 6d.; and cost of labour, £2 11s.; or total cost of spraying, £4 12s. 6d. The yield was about 15 tons, returning about £100. Mr. Gallard estimates that at least one-third would have been lost if they had not been sprayed, the estimate being based upon results of two unsprayed plots under observation in the same locality, and as nearly as possible under the same conditions. An expenditure of £4 12s. 6d. saved over £30 in hard cash, besides protecting the soil from contamination.

Average Monthly Rainfall Table.

THE following figures, supplied by the Commonwealth Meteorological Bureau, show the average rainfall for each month of the year, as far back as the monthly records go, at 107 stations in New South Wales. Stations have been selected as typical of their districts as practicable, and so placed that an approximate estimate of the rainfall at intervening points may be obtained by comparison with surrounding stations for which figures are given. The rainfall is in points (100 = 1 inch).

Stations.	Years.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total inches.
NORTH COAST.														
Byron Bay	17	836	1085	1043	615	808	585	439	516	333	394	496	705	78·53
Lismore	25	601	761	773	453	459	325	396	295	279	258	363	462	54·25
Casino	36	534	634	608	408	293	238	253	226	212	279	336	397	44·18
Grafton	40	502	495	494	357	259	242	217	178	191	254	298	363	38·50
Woolgoolga	23	616	799	908	575	481	462	382	434	276	382	365	601	62·81
Kempsey	28	444	556	540	372	336	344	301	332	238	272	334	416	44·85
HUNTER AND MANNING.														
Port Macquarie	39	587	755	631	600	578	477	437	385	415	325	414	605	62·09
Taree	27	400	650	480	400	284	329	340	315	212	244	315	467	44·36
Gloucester	19	419	460	550	308	260	257	325	268	229	310	333	465	41·84
Dungog	22	395	491	525	352	268	306	319	310	245	299	334	395	42·39
Raymond Terrace	12	231	297	369	340	296	241	385	439	332	313	237	253	37·33
Newcastle	48	350	460	546	442	483	417	444	342	326	298	287	323	47·18
West Maitland	42	323	364	394	272	245	252	267	242	266	227	242	284	33·78
Singleton	29	258	324	338	231	174	226	218	204	205	218	247	275	29·18
Muswellbrook	39	218	252	216	163	161	206	168	175	163	177	202	235	23·36
Murrurundi	38	267	304	258	219	212	303	226	271	246	271	270	322	31·69
METROPOLITAN.														
Sydney	51	341	477	509	532	505	531	454	327	292	284	299	248	47·99
Parramatta	51	328	395	373	374	285	324	315	248	223	226	238	269	35·94
Penrith	13	179	248	234	230	190	190	336	268	139	156	189	246	26·05
Richmond	25	342	265	378	255	272	261	233	189	210	220	233	289	31·47
Windsor	47	283	352	349	272	282	300	222	177	191	196	238	226	30·88
Camden	25	322	225	296	223	184	265	242	208	146	171	195	251	27·28
SOUTH COAST.														
Picton	30	321	262	335	279	194	246	216	196	179	222	191	267	29·08
Wollongong	36	404	494	414	492	386	459	326	277	277	277	269	290	43·65
Kiama	24	464	484	618	472	414	524	435	385	308	278	304	388	50·74
Berry	19	630	532	701	604	460	671	536	424	366	331	359	442	60·57
Nowra	26	385	309	395	295	285	462	346	296	199	233	220	281	37·13
Milton	23	330	428	417	452	450	359	447	291	309	360	304	337	44·84
Braidwood	33	269	204	216	229	212	256	181	216	195	232	208	213	26·91
Bodalla	34	342	413	407	287	273	320	225	256	282	285	260	262	36·12
Bega	29	289	312	326	253	275	354	204	260	198	262	199	268	32·00
Eden	38	314	326	320	293	347	360	239	227	230	285	243	252	34·36
Moss Vale	38	342	364	373	330	366	382	357	273	235	311	271	247	38·51
NORTHERN TABLELAND.														
Tenterfield	39	455	321	333	183	179	218	228	188	240	257	337	374	33·13
Glen Innes	28	431	314	295	187	182	240	179	203	220	309	336	357	32·51
Inverell	35	357	289	312	210	186	230	193	207	217	259	249	312	30·21
Armidale	47	362	345	298	201	177	267	193	202	223	275	333	356	32·32
Walcha	24	324	289	292	198	171	263	170	197	234	259	312	343	30·51
CENTRAL TABLELAND.														
Coolah	25	276	271	256	178	195	236	187	240	202	212	225	286	27·64
Gulgong	38	246	262	228	139	176	196	152	187	185	176	202	238	23·80
Mudgee	39	221	233	196	201	210	250	180	208	230	231	201	241	26·02
Orange	40	278	275	270	237	315	436	304	339	322	319	277	255	36·27
Blayney	24	302	185	233	212	201	321	267	293	264	265	183	237	29·63
Bathurst	51	249	220	202	174	176	194	159	166	188	210	212	189	23·39

Average Monthly Rainfall Table—*continued.*

Stations.	Years.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.	Total inches.
						SOUTHERN TABLELAND.								
Crookwell	26	287	183	226	220	212	422	299	322	303	278	195	232	31·79
Goulburn	46	266	247	201	164	175	205	159	182	201	212	202	199	24 13
Yass	29	224	124	161	180	175	268	189	214	198	221	171	169	22·94
Queanbeyan	39	236	183	190	169	170	196	131	158	177	225	216	196	22·47
Kiandra	37	408	310	404	458	527	868	625	594	667	676	489	366	63·92
Adaminaby	20	238	195	243	198	175	345	221	201	271	289	225	229	28·30
Cooma..	45	201	219	177	138	123	149	118	95	160	181	188	158	19 07
Delegate	20	218	199	229	207	184	291	224	178	211	248	175	223	25 87
Bombala	25	240	171	197	149	137	268	176	164	162	196	177	237	22 74
						NORTH WESTERN SLOPE.								
Warialda	32	315	335	300	176	185	208	159	187	214	225	230	273	28·07
Bingara	30	319	344	317	200	220	221	184	217	211	266	256	308	30·63
Narrabri	40	280	308	276	177	210	215	170	179	178	185	232	215	26·25
Boggabri	25	208	262	269	126	163	197	139	200	153	178	201	238	23·34
Gunnedah	32	228	254	279	170	180	171	149	210	186	204	209	258	24·98
Quirindi	27	268	264	266	186	200	228	155	210	206	218	243	318	27·62
Tamworth	34	266	260	217	199	186	226	171	212	215	231	270	279	27·32
						CENTRAL WESTERN SLOPE.								
Coonabarabran ..	30	274	356	311	267	248	234	188	256	210	217	212	251	30·23
Gilgandra	24	251	181	231	254	203	205	196	202	163	174	189	240	24·93
Dubbo..	38	197	192	183	192	194	200	155	186	192	158	182	199	22·30
Wellington	28	196	172	178	188	184	198	161	211	178	195	199	238	22·98
Molong	25	274	189	261	233	233	285	207	257	240	234	200	277	28·90
Parkes..	19	228	140	230	176	187	205	177	178	196	172	126	151	21·66
Forbes..	34	165	172	203	178	176	176	148	174	220	189	134	154	20·88
Grenfell	24	210	196	203	201	188	275	213	217	221	207	140	190	24·61
						SOUTH WESTERN SLOPE.								
Young	39	194	171	190	208	210	303	225	228	234	234	169	181	25·47
Burrowa	28	202	130	166	190	168	234	174	197	181	201	147	181	21·71
Cootamundra ..	25	238	136	173	202	165	263	199	210	182	217	144	173	23·02
Junee	27	149	122	173	162	165	240	171	184	189	198	145	138	20·36
Wagga	37	148	140	179	178	195	278	183	199	183	215	162	128	21.88
Germanton	24	184	140	197	213	228	381	288	260	229	234	199	183	27.36
Albury	46	146	168	207	226	253	351	271	283	257	281	195	159	27.97
Tumbarumba.. ..	25	276	187	306	270	290	551	387	384	364	378	261	263	39.17
Tumut	24	245	144	247	246	243	435	299	299	288	290	205	212	31·53
Gundagai	17	145	95	198	215	178	302	205	223	190	224	141	172	22·88
						NORTH WESTERN PLAIN.								
Mungindi	23	251	307	259	151	130	154	100	127	129	147	147	176	20·78
Moree	31	268	321	266	142	172	181	131	152	167	191	195	193	23 79
Walgett	31	211	244	176	147	164	144	108	142	120	135	160	146	18·97
Wee Waa	26	276	266	271	166	188	201	160	181	154	173	185	191	24·13
Pilliga	27	234	240	180	144	189	163	133	161	136	148	147	177	20·52
Baradine	25	228	249	205	205	244	213	178	194	146	172	173	177	23·84
						CENTRAL WESTERN PLAIN.								
Coonamble	32	181	224	207	177	155	145	116	144	149	152	150	157	19·57
Nyngan	28	204	228	189	161	143	110	108	151	101	97	123	148	17·63
Warren	24	181	182	190	178	134	135	113	165	107	112	130	159	17·86
Trangie	24	206	179	219	182	167	171	153	179	144	150	152	145	20·47
Narromine	17	195	154	191	190	134	164	147	193	122	130	141	122	18·83
Dandaloo	21	241	189	229	211	163	151	148	162	144	151	132	158	20·79
Trundle	10	113	101	163	234	103	98	131	146	143	118	97	131	15 78
Condobolin	29	183	137	156	153	148	150	124	161	128	152	111	144	17·47
Wyalong	28	156	107	142	150	147	196	149	171	155	182	137	125	18·17
						RIVERINA.								
Cudgellico	28	153	111	117	123	136	150	111	138	139	132	104	139	15·53
Hillston	23	106	89	123	117	145	153	115	141	114	135	93	71	14·02
Narrandera	25	136	112	147	149	147	202	151	165	138	172	117	90	17·26
Urana	39	95	129	154	141	176	220	130	150	140	159	119	99	17·12
Deniliquin	50	98	106	146	156	161	175	125	144	159	157	114	83	16·24
Corowa	27	135	124	170	161	183	261	186	203	179	187	141	141	20·72
Moulamein	22	70	73	94	127	136	177	107	135	109	108	101	91	13·28
Jerilderie	21	94	85	122	141	151	188	120	170	116	134	122	101	15·43
						WESTERN DIVISION.								
Cobar	29	155	140	113	132	123	123	85	127	97	119	116	122	14·52
Bourke	38	197	183	156	133	104	108	87	94	92	107	127	116	15·04
Wilcannia	31	101	70	115	75	104	98	57	86	73	95	57	73	10·04
Wentworth	39	85	63	77	88	121	125	89	107	104	97	95	95	11·46
Brewarrina	36	229	190	185	131	107	157	95	104	138	110	119	95	16·60
Angledool	20	209	213	169	101	116	138	85	103	123	119	91	167	16·34

Orchard Notes

W. J. ALLEN.

JANUARY.

DURING the last month good soaking rains have fallen throughout the greater portion of our fruit-growing districts, and trees and vines are in splendid condition, and the promise for a good crop is very bright.

Cultivation.

Should rain fall during the month the soil should receive a thorough cultivation immediately it is dry enough, and all young trees would benefit by having the soil which may have been missed by the cultivator well loosened up. Where any weeds have made their appearance in the orchard the soil should be well stirred up with the cultivator—as all weeds, summer grass, &c., tend to rob the ground of the moisture which at this time of the year is so badly needed for the trees and vines.

Irrigation.

Wherever water is available to irrigate fruit trees or vines, it is more than likely that they will require a thorough soaking this month. See that the water is confined to furrows, and be careful not to allow it to flood over any portion of the land; also, that the best use is made of such water, and that none of it is allowed to run to waste.

After the soil has been well soaked, and as soon as the land is sufficiently dry to work, give it two deep cultivations in order to bring it to a proper state of tilth. Also see that all vines and trees are well worked around with a fork hoe while the soil is still damp. This will keep the ground from baking and prevent excessive evaporation.

Codling Moth.

See that all bandages are given careful and regular attention, and that all infested fruit is picked from the trees and ground, and destroyed by boiling or burning, in accordance with the regulations under the Fruit Pests Act Give final spraying with arsenate of lead.

San Jose Scale.

Wherever it is found that trees are affected with this scale, they should receive a thorough spraying as soon as the crop is harvested, with the special resin wash. Leaflets can be had on application to the Department of Agriculture.

Prune trees affected with this scale at Wagga were successfully fumigated in the early part of November, without damaging either leaves or fruit; the work, however, was performed during the coolest part of the day, and the dose used was a little heavier than that shown in No. 2 Table for citrus trees. [See Departmental Leaflet No. 663, obtainable on application to the Under Secretary, Department of Agriculture.]

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of scale insects. This work may be commenced this month provided the trees are in good strong condition, but as this is usually a very hot month the work will have to be done on cool days or at nights, but never fumigate during the heat of the day at this time of the year.

Summer Pruning.

Wherever young apple, pear, or apricot trees are found to have too much growth throughout the centre of the trees they should be thinned out, cutting back the superfluous growth to within about 3 inches of the main limbs or spurs from which they spring. This will open up the tree so as to admit light and air, which are both necessary for the proper development and ripening of wood, as well as assisting the tree in its efforts to develop fruit spurs.

Re-working Old Trees.

The latter part of this month is the best time to bud to better varieties all poor or worthless varieties of fruit trees found growing in the orchard. Be sure that the buds to be used are taken from trees which have borne fruit of the very best quality. Insert them on the outer or underneath side of the limbs, where it will be found that the bark usually raises more easily than on the upper side, and where they are more apt to form a well-shaped tree than where the buds have been inserted on the upper or inner side of such limbs.

Vines.

See that no suckers are allowed to remain on the vine, and in coastal districts it will be found advisable to top them where they are putting on strong growth.

Preparing for Cover Crops.

Do not forget to order black tares, peas, rape, rye seed, or whatever crop it is intended to sow for green manure between the trees. The seed should be ordered towards the end of this month, so that it will be on hand when required.

Marketing Fruit.

See that any fruit intended for market is not allowed to become too ripe before being picked, else by the time it reaches the consumer it will be in an over-ripe condition. Grade all fruit evenly and pack it neatly and securely, so that it will present a good appearance when put before prospective buyers

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Mr. F. Chilton, who fumigated trees some five months after spraying them with Bordeaux mixture, states that they were damaged by the treatment. I would like to hear from others who have fumigated trees after spraying them with the above mixture, whether or not the trees suffered, to what extent, and how long after.

From Mr. G. Morgan, of St. Pelagius, Blacktown, I have to acknowledge the receipt of a punnet of Creswell Seedling strawberries, which for size and flavour it would be hard to surpass.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ...	Pansy 4th (imp.).	Wollongbar Farm	†
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ...	Berry Melbourne	Melbourne (imp.).	Rum Omelette (imp.).	Berry Farm ...	*
Guernsey ...	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Wyrallah	7 Mar., '11.
,, ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Lismore	10 April, '11.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Dunoon	3 April, '11.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Casino	21 June, '11.
,, ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Berry Farm ...	*
,, ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Cumbalum ...	10 Jan., '11.
Red Poll ...	The Judge ...	Barrister (imp.)	Lovely 8th (imp.).	Grafton Farm ...	*
Ayrshire ...	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince	Rosie 5th ...	Grafton Farm ...	*
,, ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ...	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

E

Department of Agriculture,
Sydney, 3rd January, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

AYRSHIRE.—Sandy: sire, Auchenbrain Spicy Jock (imp.); dam, Rose Flower; calved 8th April, 1909; colour, brown and white. Price, **£20.**

Rose Flower is from Roseberry, by Daniel of Auchenbrain (imp.). Roseberry from Roseleaf of Barcheskie (imp.), by Mischiefmaker (imp.).

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRES.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

Emerald's Mischief: sire, Prince Emerald (imp.): dam, Miss Prim, by Mischiefmaker of Barcheskie (imp.), from Primrose of Barcheskie (imp.), by Royal Stuart of Glenbuck, from Lindsay 7th of Barcheskie; calved 4th August, 1903; colour, white and red. Price, **£25.**

WOLLONGBAR EXPERIMENT FARM.

HOLSTEIN.—Marjorie's Boy: No. 223. Sire, Obbe II; dam, Marjorie; calved 23rd February 1910. Price, **£15.**

Marjorie, by The Hague, from Lady Margaret, by Obbe (imp.), from Queen Margaret, by Max, 3028, from Margaretha (imp.).

AYRSHIRE.—Colonel: No. 211. Sire, Jamie's Ayr; dam, Colon; calved 26th December, 1909; colour, red and white. Price, **£15.**

GUERNSEYS.—Captain Hayes: No. 218. Sire, Prince Souvia; dam, Hayes' Lily du Preel (imp.); calved 31st January, 1910. Price, **£40.**

Tewkesbury: No. 221. Sire, Prince Souvia; dam, Parson's Red Rose (imp.); calved 19th February, 1910. Price, **£45.**

Holstein Heifers for Sale.

WOLLONGBAR EXPERIMENT FARM.

Name.	Dam.	Sire.	Date of Birth.
Molly	Marjory	Hollander	25 October, 1908.
Florrie	Frolic	President Douwe ...	5 November, 1908.
Lorene	Lolkye Field	Obbe II	2 March, 1909.
Grace	Lady Grace	do	5 May, 1909.
Lady Holland ...	Lady Hague	do	13 May, 1909.

Price, £20 each.

H. C. L. ANDERSON,
Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. G. Fraser	Jan. 18, 19
Gosford and Brisbane Water A. and H. Association	R. J. Baker	,, 20, 21
Kiama A. Association	R. Somerville	,, 26, 27
Alstonville A. Society	W. W. Monaghan	Feb. 8, 9
Berry A. Association	C. W. Osborne	,, 8, 9
Moruya A. and P. Society	P. Flynn	,, 8, 9
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 15, 16
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 15, 16
Gunning P., A., and I. Society	J. L. Sands	,, 22, 23
Manning River A. and H. Association (Taree)	S. Whitbread	,, 22, 23
Ulladulla A. Association (Milton)	J. Boag	,, 22, 23
Kangaroo Valley A. and H. Association	J. Moffit	,, 23, 24
Nambucca A. and H. Association	E. M. Walker	,, 23, 24
Wyong A. Association	J. H. Kay	,, 23, 24, 25
Central Cumberland A. and H. Association (Dural)	H. A. Best	,, 24, 25
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 28, Mar. 1, 2
Inverell P. and A. Association	J. McIlveen	,, 28, Mar. 1, 2, 3
Braidwood P., A., and H. Association	L. Chapman	Mar. 1, 2
Bega A., P., and H. Society	T. W. A. Zingel	,, 1, 2, 3
Robertson A. and H. Society	R. J. Ferguson	,, 2, 3
Bowraville A. Association	C. Moseley	,, 2, 3
Gundagai P. and A. Society	A. Elworthy	,, 7, 8
Bangalow A. and I. Society	W. H. Reading	,, 7, 8, 9
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 7–11
Bombala Exhibition Society	W. G. Tweedie	,, 8, 9
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 8, 9
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 8, 9, 10
Crookwell A., P., and H. Society (Annual Show)	M. P. Levy	,, 9, 10
Gloucester A., H., and P. Association	S. J. Bignell	,, 9, 10
Nepean District A., H., and I. Society (Penrith)	P. C. Smith	,, 9, 10
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 9, 10
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 14, 15, 16
Campbelltown A. Association	F. Sheather	,, 15, 16
Cobargo A., P., and H. Society	T. Kennelly	,, 15, 16
Tumut A. and P. Association	T. E Wilkinson	,, 15, 16
Bellinger River A. Association (Bellingen)	S. S. Hindmarsh	,, 15, 16, 17
Mudgee A. Society	H. Lamerton	,, 15, 16, 17
Quirindi District P., A., and H. Association	G. Haughton	,, 15, 16, 17
Port Macquarie and Hastings District A. and H. Society	W. R. Stacy	,, 16, 17
Goulburn A., P., and H. Society	J. J. Roberts	,, 16, 17, 18
Armidale and New England P., A., and H. Association	A. McArthur	,, 21–24
Molong Agricultural Society	W. J. Windred	,, 22
Camden A., H., and I. Society	C. A. Thompson	,, 22, 23, 24
Clarence P. and A. Society (Grafton)	T. T. Bawden	,, 22, 23, 24
Taralga A., P., and H. Association	G. C. Goodhew	,, 23, 24
Wauchope P., A., and H. Association	A. D. Suters	,, 23, 24
Newcastle A., H., and I. Association (Annual Show)	C. W. Donnelly	,, 23, 24, 25
Blayney A. and P. Association	E. J. Dann	,, 28, 29
Lower Clarence A. Society (Maclean)	F. W. Collison	,, 28, 29

Society.	Secretary.	Date.
Luddenham A. and H. Society	F. Shawe	Mar. 28, 29
Walcha P. and A. Association	J. New-Campbell	,, 28, 29
Narrabri P., A., and H. Association	H. R. Thurlow ...	,, 28, 29, 30
Yass P. and A. Association	W. Thomson ...	,, 29, 30
Cooma P. and A. Association	C. J. Walmsley ...	April 5, 6
Dorrigo A. Society	F. T. Stennett ..	,, 5, 6
Dungog A. and H. Association	C. E. Grant ...	,, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 5, 6, 7
Royal A. Society of N.S.W. (Sydney)...	H. M. Somer ...	,, 11–19
Queanbeyan P., A., H., and I. Association	E. C. Hinckman	,, 12, 13
Bathurst A., H., and P. Association	A. H. Newsham ..	,, 26, 27, 28
Richmond River A. P. and H. Society (Casino) ...	D. S. Rayner .	May 3, 4
Orange A. and P. Association	W. Tanner ...	,, 3, 4, 5
Hay P. and A. Association	G. S. Camden ...	July 11, 12
Deniliquin P. and A. Society	L. Harrison ...	,, 20, 21
National A. and I. Association, Brisbane, Queensland	C. A. Arvier ...	Aug. 7–12
Murrumbidgee P. and A. Association (Wagga) ..	A. F. D. White ...	,, 22, 23, 24
Wellington P., A., and H. Society	A. E. Rotton ...	,, 29, 30, 31
Young P. and A. Association	G. S. Whiteman...	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart ...	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys...	,, 6, 7
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith ...	,, 13
Canowindra P., A., and H. Association	G. Newmon ...	,, 19, 20
Temora P., A., H., and I. Association	J. Clark	,, 19, 20, 21

CONTRIBUTIONS TO THE FARRER MEMORIAL FUND.

Name.	Address.	£	s.	d.
Amount received up to 21st November, 1910		966	8	4
Farmers and Settlers' Association	Wyalong	4	3	0
Do do	Bectric (Coolamon)	2	3	6
P., A., and H. Association	Dubbo	2	2	0
P., A., and H. Society	Corowa	5	5	0
G. C. Morphett...	do	1	1	0
T. J. Gorman	do	3	3	0
Henry Hay	do	1	1	0
F. W. Knight	do	0	10	6
J. H. Willis	do	0	10	6
J. W. Tenney	do	0	5	0
John Goodwin	do	0	5	0
Joseph Barthelson	do	0	5	0
F. W. C. Warner	Attunga	0	12	9
J. V. Ingram	Deniliquin	2	0	0
E. H. Collins	Drummoyne	1	1	0
Sir Walter James	Perth, W.A.	1	1	6
Total amount received to 21st December, 1910 ...		£991	18	1

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VOL. XXII. PART 2. FEBRUARY 2, 1911.

Agricultural Gazette of New South Wales.

The Present Position of the Flour Question.*

F. B. GUTHRIE.

THE present position of the flour question may be summed up, briefly, in the statement that millers are asking for wheats that yield a strong flour, and that this kind of wheat is not produced in quantities sufficient to supply their demand, and commands in consequence a higher price.

This requirement is especially made by English millers, and as England is our principal market it is important that we should keep this fact definitely before us, and aim at increasing the flour-strength of our wheats, in order that we may hold our own in the world's markets. In the principal wheat-producing countries, the United States, Canada, and India, and in England itself, which, though not a wheat-exporting country, is one of the largest consumers, and one most largely interested, systematic efforts are being made to breed improved varieties which shall possess this important characteristic of flour strength in addition to other desirable qualities.

The Improvement of Wheat.

The following facts will serve to show the great importance which is now being attached to this question of the improvement of wheats:—

Some years ago the National Association of British and Irish Millers appointed a committee called the Home-grown Wheat Committee, having for its special object the improvement of British wheats. This body consisted of practical millers and farmers, and the scientific work was carried out in the laboratories of Rothamsted and of Cambridge University. This committee has done a large amount of valuable work, especially in the production of improved varieties suitable for English conditions and in the elucidation of the problems connected with baking quality in flour. The same association, after its recent meeting at Chester in 1909, passed a resolution affirming the desirablity of establishing a national cereal-breeding station.

At the close of the meeting of the British Association, held in Winnipeg in 1909, the president of the section before which a number of papers were read dealing with wheat, made the suggestion that the city of Winnipeg should tax itself in order to found a University in which wheat could be studied from every point of view.

Australia's Pioneering Work.

Australia has done pioneering work in this direction, and has been especially fortunate in possessing an enthusiast like the late Mr. Wm.

* A paper read before the Sixth Federal Convention of Master Bakers of Australia, Sydney, October, 1910.

Farrer, who was the first to see clearly the importance of breeding for strength, at a time when other breeders were confining their attention to increasing yield, resistance to rust, &c. No new variety was allowed to leave his hands until it had been tested in the departmental testing mill and had been pronounced a first-class milling wheat. The result is that, while he has given us varieties which are more prolific and drought and rust resistant than the older varieties, they are all of high-class milling and baking quality.

All Mr. Farrer's new wheats were the result of cross-breeding with the object of combining the good qualities of the parents. In this respect he also showed his prescience, for a very large number of his crosses (indeed, nearly all his best known and most successful ones) contained Fife blood; and of all the hard wheats known it has been found that Fife wheat is pre-eminent in that it does not lose its flour-strength when grown under altered climatic conditions.

We may expect still more striking advances in the cross-breeding of wheat by the application of Mendel's law of inherited qualities, by means of which the combination or elimination of certain characteristics can be ensured with certainty and expedition. This law was unknown to Farrer and his contemporaries, and by its means there is no doubt that present and future wheat-breeders will be able to achieve results hitherto unattainable.

Another important feature of Farrer's work was that he discarded the practice, then almost universal, of propagating by selection—that is, by taking the ears or plants which showed more especially the desirable characteristics, and sowing these separately. He discarded this in favour of cross-breeding, and it is now generally recognised that selection without cross-breeding is of little value, as the selected grains have a tendency to revert and lose the required characteristics; whereas by cross-breeding a definite new strain can be fixed, possessing certain characteristics.

It is in three important particulars that Farrer's work was differentiated from that of previous investigators. He saw, in the first place, the importance of breeding for strength; he realised the value of wheats of the Fife class in perpetuating this characteristic; and he relied on cross-fertilisation and selection rather than on selection alone in order to produce the required results.

Strength.

I have drawn attention to the great importance now attached to the production of strong-flour wheats. It may be of interest to examine a little more closely what is meant exactly by the term "strength"—what produces it, and how it can be determined.

The term "strength" is used by the baker to express the combination of qualities which he associates with a flour of good baking quality, such as pile, texture, shape, volume, colour, and weight of loaf. It is, in fact, another name for good baking quality. In order to place the problem on a satisfactory basis, the British Home-grown Wheat Committee has arrived at the following definition of flour-strength as "The capacity to make a big

well-piled loaf." Professor Wood further points out that this is a complex of at least two factors, size and shape of loaf. The definition thus stated appears to include all the qualities the presence of which render a flour of good baking quality, and to provide a clear statement of the problem presented to us.

What exactly determines this important quality is not accurately known, and the only reliable test of the strength of a flour is its actual behaviour on baking. As this largely depends on the skill of the individual, and the methods he adopts, it cannot be considered an entirely satisfactory test, and many attempts have been made to determine the cause of strength, and to devise some means by which we might be able to determine beforehand how a given flour will behave on baking. Several factors have been suggested as being responsible for strength of flour, such as the quantity of gluten, the chemical nature of the gluten, amounts of sugar, of mineral constituents, &c., in the flour; but so far none of them have provided a satisfactory solution of the problem. The only test that has proved satisfactory in our experience is the power of the flour to absorb water—its "water-absorbing capacity," or the amount of water taken up by the flour to make a dough of the right consistency for baking. This test, though not one that can be carried out with extreme accuracy, has, with us at all events, always proved reliable, and the power of absorbing water has always been associated with good baking quality. Without asserting that this test gives the actual strength of the flour, I do claim that it is the measure of such strength, and the best proof of its reliability lies in the fact that all Mr. Farrer's strong-flour wheats were submitted to this test, and were persisted in or rejected according as they gave flour of high water-absorbing power or not.

This quality in wheat is to some extent affected by environment, by the nature of the soil and climate, and particularly by the nature of the weather during the ripening period of the grain; a hot and dry summer, in which the grain, after it is formed, is rapidly ripened, always increases the flour-strength. It is, however, an inherent characteristic of certain varieties, and soft wheats, though they may become stronger under hot and dry conditions, never attain the flour-strength of the harder strong-flour variety. Flour-strength is an inherited characteristic, and can be bred for just as colour, stiffness of straw, stooling, beards, &c., can be bred for. It would appear that strength and weakness are Mendelian pairs, and the breeding of strong-flour wheats becomes, in competent hands, a certain operation, which can be regulated in the same manner as is the case with other characteristics.

Strength does not appear to be affected by manuring. Even the use of nitrogenous fertilisers, which might be expected, by increasing the protein matter, to also increase the strength, appears to have no effect on this quality.

Gluten-content.

The actual gluten-content of wheat is a matter of less importance than flour-strength. Flour-strength is almost invariably associated with fairly high gluten-content, though the reverse is by no means the case, and some of the

Dunum wheats, which contain up to 20 per cent. of dry gluten, are among our weakest wheats. It may safely be said that whilst gluten-content itself is no guide to the flour-strength, still, between two wheats of the same variety, that one will be the stronger which contains the largest amount of gluten.

A high gluten-content is an almost invariable accompaniment to a dry and hot period during the ripening stage.

It is doubtful whether any very great advantage is to be gained by breeding for increased gluten-content alone. If it were possible to increase the gluten-content to about 14 per cent. gluten in the bread we should possess a food-stuff which would certainly provide, in about 2 lb. weight, all the nitrogenous and starchy material required to sustain life; but it would still require the addition of fat, in the shape of butter, to form a complete food, since a certain amount of fat is necessary, and this is absent in bread. Even then it is doubtful whether any great advantage would be gained. Variety in food is just as important as a well-balanced ration, and we can readily supply the present lack of protein in bread by the addition of meat.

Colour.

As the demand for strong-flour wheat has become greater the question of colour has assumed less importance. The wheats which produced the dazzling white flours once in demand were not those that gave high strength, but, like the Californian and the Australian wheats, were of a starchy nature, giving a weak flour.

The colour of the flour is, moreover, by no means a sure guide to the colour of the baked loaf. The very white flours often produce a loaf of a dirty grey colour, whereas those with a slight yellow tinge give almost invariably the brightest loaf.

As a rule, the strong-flour wheats give a flour which is not so high in colour (not so white), and, in order to obtain a white flour from them, patent processes have been devised for bleaching them. These processes depend, for the most part, on the action of nitrous oxide.

In the United States the authorities have decided that bleached flour is an adulterated article, and millers who use such processes are rigorously prosecuted. The prosecution is, indeed, being conducted with an energy that strikes one as being rather excessive, and the most exaggerated charges are made with regard to the action of bleached flour on the system. The procedure is reminiscent of the charges one used to hear about flour made by the steel rollers, which has been accused of causing appendicitis, indigestion, and many other complaints.

Considerable interest is being taken in a case recently tried in Kansas, in which a great deal of evidence was given on behalf of the prosecuting department with regard to the injurious action of the nitrites in bleached flour. One of the witnesses made rather a dramatic point when the cork blew out of a bottle of bleached flour, which was one of the exhibits. He attributed this to the action of nitrous acid on the flour.

The question is not one that is likely to trouble local millers, since our wheats all produce flour of first-rate colour, even when judged by the most

exacting standard; indeed hitherto the principal value of our wheats on the English market has been that their high colour rendered them suitable for blending with the stronger American wheats which were not always of such high colour. At the same time it is well for us to remember that the possession of means for artificially improving flour colour will affect the pre-eminence of Australian wheats in this respect, and that the possession of high colour is of less urgency now than it has hitherto been, and of much less importance than flour-strength, which cannot be artificially produced.

Nutritive Value of Bread from Strong and Weak Flours.

Professor Harcourt, of Ontario, has carried out some analyses of bread made from hard and soft wheat flour respectively, with interesting results. The rather peculiar conclusion is arrived at that the total heat units (calories) of the bread made from strong flour are higher than is the case of bread made from the same quantity of weak flour; but if we take equal quantities of bread made from hard and weak flour respectively the advantage is slightly in favour of the weak flour. This is due to the larger proportion of starch present in the weak flour, and simply serves to accentuate the fact that bread from weak flour is more starchy, and contains less gluten than bread from strong flour.

Professor Harcourt obtained the following results on making bread from 12 oz. of Hard Spring Manitoba and Soft Winter Ontario flour respectively:—

	Weight of Loaf.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Calories.
Manitoba ... ... (Hard Spring.)	17·65	6·38	1·40	0·30	9·34	0·23	1,424
Ontario... ... .. (Soft Winter.)	16·51	5·43	0·95	0·27	9·67	0·19	1,380

If, however, we compare 16 oz. of bread made from the same hard and weak flours we get the following results:—

16 oz. Bread made from—	Protein.	Fat.	Carbohydrates.	Calories.
Manitoba	1·27	0·27	8·47	1,291
Ontario	0·92	0·26	9 37	1,337

There is, therefore, very little to choose in nutritive value between bread from strong or from weak flour, but a given quantity of hard or strong flour provides more nutrition in the form of bread than does the same quantity of weak flour.

Comparative Value of White and Whole-meal Bread.

It is a not uncommon belief that brown bread, or whole-meal bread, is more nutritious than that made from fine flour. This idea is not borne out by facts, whether we discuss the actual composition of the bread or its digestibility.

We would expect in bread containing the bran of wheat (whole-meal bread), or bread to which the bran has been added, a higher percentage of protein matter, and also more mineral matter, for bran is very high in both mineral matter and nitrogen; and, moreover, the aleurone layer, which contains a large proportion of the nitrogenous matter of the wheat-berry, is closely attached to the bran, and is not included in the flour made by the modern roller process.

In spite of this fact, however, it has been found that whole-meal, or brown bread, though richer in mineral matter than white, is, on the whole, lower in protein. Atwater gives as high as 9½ per cent. protein in white bread, as against 5 per cent. in whole meal. Other investigators have found less difference, but whatever difference there is is always in favour of white bread, which invariably shows somewhat higher proportions both of protein and starch.

Whole-meal bread always contains a larger proportion of indigestible cellulose, or fibre from the bran, which is what one would expect.

But it is when we come to discuss the digestibility of these two forms of bread that the most striking differences are noted. When white bread (bread from fine flour) is consumed, 95½ per cent. of its weight is absorbed, whereas only 88 per cent. of brown bread is so absorbed. This lower power of digestibility of whole-meal bread is no doubt due to the presence of indigestible bran particles. Their presence does, however, stimulate the peristaltic action, and is perhaps of value to those in whom this action is sluggish.

Taking the mean of reliable experiments, Hutchinson concludes that in whole-meal bread from 70 to 80 per cent. of the protein is absorbed, 94 per cent. of the starch, and about 50 per cent. only of the mineral matter; whereas, in white bread, 80 per cent. protein, 97 per cent. starch, and 75 per cent. of the mineral matter are absorbed, showing a very considerable advantage in favour of the digestibility of fine-flour bread.

Exporting Flour instead of Wheat.

In the discussion of the question that arises from time to time as to the best method of handling wheat for export the further question presents itself, whether it would not be advantageous to us as a community to confine our export trade to flour, and to do our milling locally. When wheat is 3s. 9d. per bushel flour is sold at £10 per ton. These figures are taken from recent local market reports. A fair yield of flour is 42 lb. from the 60 lb. bushel of wheat; that is to say, a ton of wheat, which at 3s. 9d. per bushel costs £7, yields 14 cwt. flour, valued at £7. In other words, the shipper, if he exports flour, sends the same value in 14 cwt. as he does when he exports a

ton of wheat. The advantages to us in exporting the flour lies in the fact that the profit in milling remains with the local millers, additional occupation is provided for local workers, and the valuable by-products—bran and pollard—which are at present lost to the State, will be retained. Bran and pollard are worth each £4 per ton when wheat is worth 3s. 9d. per bushel. Assuming that the bushel of wheat produces 9 lb. bran and 9 lb. pollard, the value of the offal in 1 ton wheat will be £1 4s., which is now the profit of the oversea miller. In 1908 the Commonwealth exported 15,000,000 bushels of wheat, the value of the offal from which is £480,000.

It must also be remembered that mill offal is very rich in phosphates, the ingredient which has been found to be essential for the production of wheat. The phosphoric acid in the bran and pollard from a bushel of wheat is ·35 lb. (5½ oz.). When, as in 1908, the Commonwealth exports 15,000,000 bushels of wheat, she sends out of the country no less than 5,250,000 lb. of phosphoric acid, which, at the present local market rate of 1½d. per lb., represents over £32,000.

The improvement in the quality of our flour, to which I have elsewhere drawn attention, will hasten the time when it will be possible to do our own milling, and to export flour instead of wheat. At present our wheats are used by English millers for blending. Flour milled from Australian wheat alone would not be of the strength to which they are accustomed. All this will, no doubt, be changed in the near future, as the strong-flour wheats are coming into more universal cultivation in Australia. The nature of our flour will improve in a corresponding degree, and Australian flour will command as good a market as, or even a better one than, Australian wheat now does. It was the importation of American flour that killed the milling industry in Ireland twenty or thirty years ago.

The World's Wheat Harvest, in Million Bushels.

	1900.	1905–06.	1908–09.
Europe—			
Russia	312	551	474
France	296	325	345½
Hungary...	144	152½	110
Germany...	156	132	134
Italy	116	155½	159½
Spain	102	89½	139½
United Kingdom	54½	60	63
Austria	41	53	56½
Roumania	54	100	55
Bulgaria	40	34	36
Turkey	32	19	29
Belgium	12	12	15
Servia	12	11	12½
Portugal	4	5	5
Sweden and Norway	4	5½	7
Holland	4	5	5
Switzerland	4	4	3½
Denmark...	4	4	4
Greece	6	7¾	7¾

	1900.	1905-06.	1908-09.
Asia—			
Japan	19½	18	21
India	184	274½	274½
Russia in Asia	48	66	75
Turkey in Asia	56	34	34
Persia	24	15½	15½
Cyprus	2½	2½	2½
Africa—			
Algeria	18	24¾	33¾
Egypt	12	24¼	24¼
Tunis	8	5½	4
Cape Colony	4	2	2
America—			
United States	544	672	714½
Argentine	72	146	157
Canada	48	106	161½
Mexico	16	9½	7¾
Chili	8	11¾	19¼
Uruguay	16	7¼	7¾
Australasia—			
Victoria	18	23½	23½
New South Wales	16	20¾	15½
South Australia	11¼	20	19¼
New Zealand	6½	9	5½
Tasmania	1	¾	¾
Queensland	1	1	1¼
Western Australia	¾	2¼	2½

The following table, from figures kindly supplied by Mr. J. B. Trivett, State Statistician, shows the quantities of wheat produced by the fifteen principal wheat-producing countries of the world in the harvests of 1900-01, 1905-06, and 1908-09, the last year for which these figures are available. The most striking feature is the extraordinarily rapid progress of Canada as a wheat-producing country. From the fourteenth place in the list in 1900 she has risen to ninth place in 1905, and in 1909 was fifth on the list. Asiatic Russia is also, more slowly but steadily, coming to the front:—

Production of Wheat in the Fifteen Principal Wheat-producing Countries.

1900-01.	Million bushels.	1905-06.	Million bushels.	1908-09.	Million bushels.
United States ...	544	United States ...	672	United States ...	715
Russia(Europe) ...	312	Russia (Europe). ...	551	Russia (Europe) ...	474
France	296	France	325	France	345
India	184	India	274	India	274
Germany	156	Italy	155½	Canada	161
Hungary	144	Hungary	152	Italy	159
Italy	116	Argentine	146	Argentine	157
Spain	102	Germany	131	Spain	139
Argentine	72	Canada	105	Germany	134
Turkey	56	Roumania	100	Hungary	109
Australia	55	Spain	89	Russia (Asia) ...	75
United Kingdom ...	54½	Australia	77	Australia	68
Roumania	54	Russia (Asia) ...	65	United Kingdom ...	63
Russia (Asia) ...	48	United Kingdom ...	60	Austria	57
Canada	48	Austria	52	Roumania	56

Budding and Grafting.

[Continued from page 66.]

W. J. ALLEN.

Grafting.

THIS method of working many varieties of vines and trees is used in preference to budding, and old trees are often top-grafted in preference to being budded, as, by inserting grafts in the branches close to the trunk, many of them will grow if properly put in; and, should any fail, a young shoot may be allowed to grow, and later on a bud inserted.

There are several methods of grafting practised, but the whip-graft finds most favour with growers for small stocks. Cleft-grafting for old grapevines is largely used, and at times for working over old fruit-trees, particularly pears, apples, plums, &c. Strap-grafting, which is another method of bark-grafting, may be used for working over medium to large sized old trees; and for this method splitting the limbs is not required, but the scion is thrust down between the bark and the wood. There are several other styles of grafting, but those above mentioned will answer for all practical purposes.

Scions.—These should be taken from good, healthy trees, and the best wood with which to work most varieties is that of the previous summer's growth. In the case of peach scions, it might be advantageous to use those which have some two years' growth at the base end. The young growth is soft and pithy, and there is a chance that not many of the grafts will start; consequently, old peach-trees are usually cut back in the winter and shoots are allowed to grow during the summer, into which buds are inserted the following February.

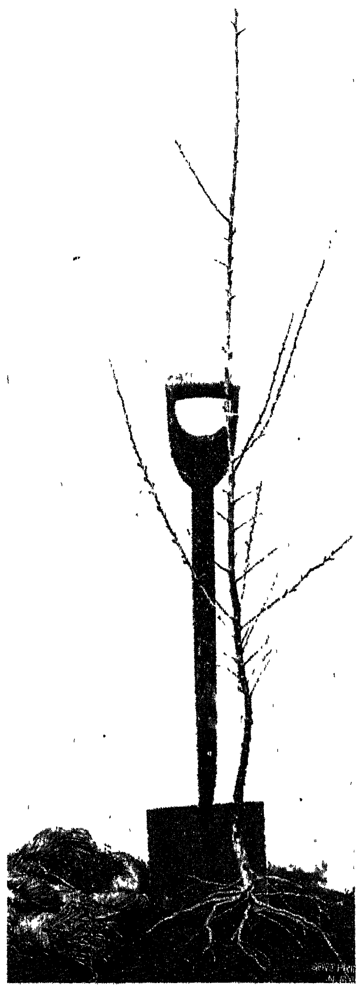


Fig. 12.—A seedling apricot ready for grafting.

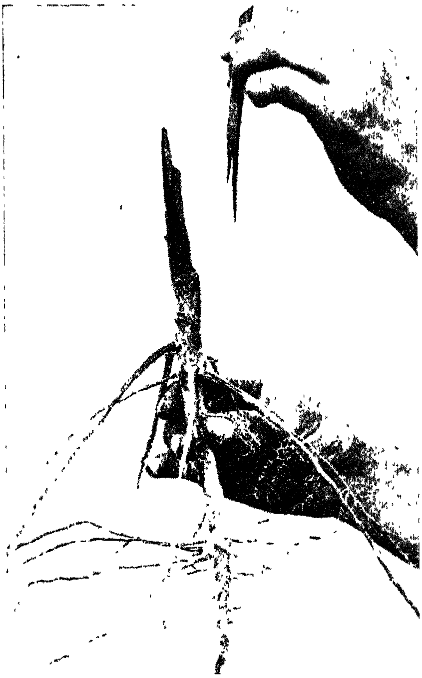


Fig. 13.—Cut back and prepared for the graft.

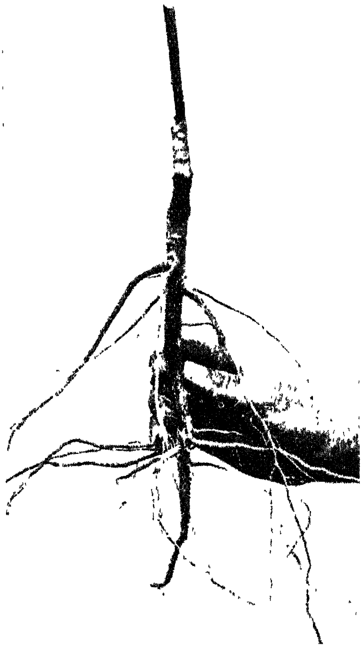


Fig. 14.—Graft completed.

Fig 15.—Bark grafts.

Fig. 15a.—Six-years old Apple tree worked with bark graft.

Whip-grafting.—This is the most popular method of working over all kinds of nursery stock; and stock in which dormant buds have failed are usually worked in this way. Root-grafts are also put in by this method. For instance: small pieces of Northern Spy apple-roots are often cut up into lengths of about 4 inches and grafted with scions of the Northern Spy. These take very readily, and by the fall I have seen them make a growth of from 3 to 6 feet, according to the richness of the soil in which they were growing.

Care should be taken to see that the inner bark or cambium of both scion and stock come in contact with one another on one side of the graft, as it is at that point of contact where the union begins to take place.

In Fig. 12 will be seen a young seedling apricot ready for grafting.

Fig. 13 depicts the tree cut back and made ready to receive the scion, while the scion can be seen ready to be inserted in the stock. It will be observed that the top of the tree has been cut off, and a smooth, sloping cut upwards of about 2 inches long has been made within a few inches of the root—the scion to the right to correspond with the stock. A cleft has been made in both stock and scion, and they are now ready to be joined together by inserting the tongue of the scion into the cleft of the stock and forcing them into place, as shown in Fig. 14, where the scion has been put in place and wrapped with waxed cloth, the same cloth being used for these as for budding. (See p. 66, January *Gazette.*)

Fig 15 shows a *bark-graft.* The scions are cut in precisely the same way as for the whip-graft, only there is no cleft made in them. The bark of the tree is split about 2 inches down, and loosened at the top sufficiently to allow the pointed end of the scion to enter. It can then be pushed down without loosening the bark much with the knife, if the tree is in condition for grafting in this way. This style of grafting is best done late, when the sap has begun to flow, and the bark is loosening from the wood. After the scions are put in, they require to be wrapped tightly with either cord or strong waxed cloth, and then the whole top, as well as around each of the scions, should be painted with grafting-wax to exclude the air. The peach-tree shown in Fig. 15 has been cut back and grafted to a plum.

Strap-grafting is another method of bark grafting, but is a somewhat slower process of re-working trees, as it takes a little longer to prepare the scion and also the stock to receive the scion, which must be made perfectly smooth and even after the limbs have been sawn off. To accomplish this a large pruning-knife or a small spokeshave, or some other sharp implement, must be run over the sawn surface to make it perfectly level. In order to make a good fit, the outer edge of the limb where the scion is bent over the top should be slightly rounded. It will, therefore, be seen that by this method it will take somewhat longer to prepare the tree to receive the graft than by those shown in Figs. 14 and 15, but it is claimed that cuts on trees worked in this way will heal more readily, and that the grafts withstand heavy winds better than will the common bark graft.

Mr. Grant, our orchardist at Bathurst Experiment Farm, thinks so much of it that he has followed this practice for some years now with very satisfactory results.

When one is grafting, budding, or pruning, all tools which are to be used should carry a keen edge, otherwise the work cannot be properly and expeditiously carried out.

Fig. 16.—A fruit-tree scion prepared for bark grafting.

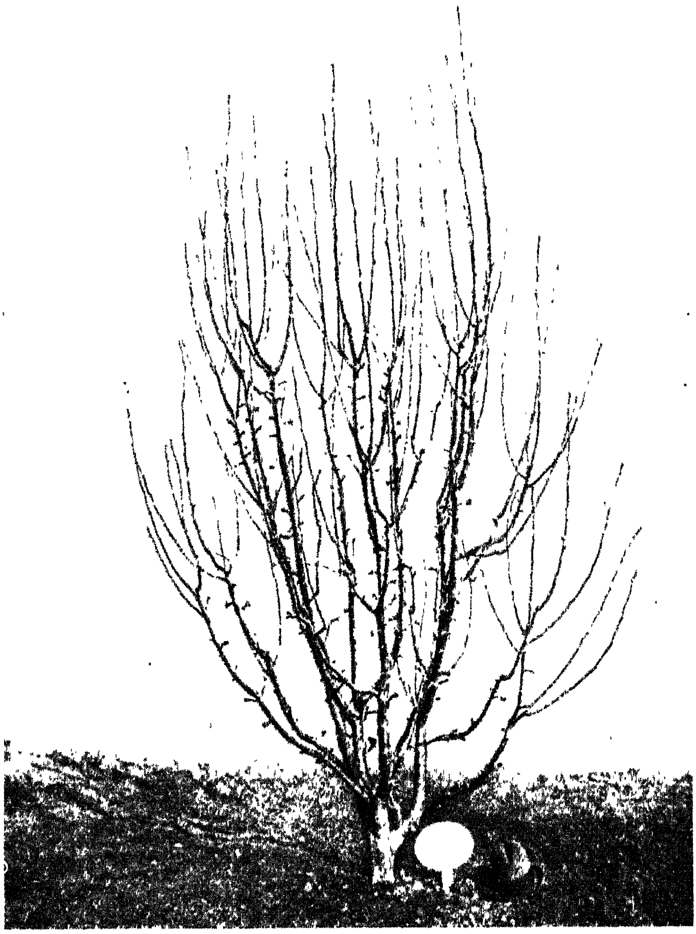


Fig. 17.—Pear tree suitable for strap-grafting.

Fig. 17 is a Lawson pear-tree (six years old), which is about to be grafted to Gansell's Bergamot by the strap graft method. Its branches start off quite close to the ground; and as the limbs are not yet very large, it is a much easier tree to graft after this method than a large old pear-tree, with limbs from 9 to 12 inches in diameter, would be. Many such can be seen

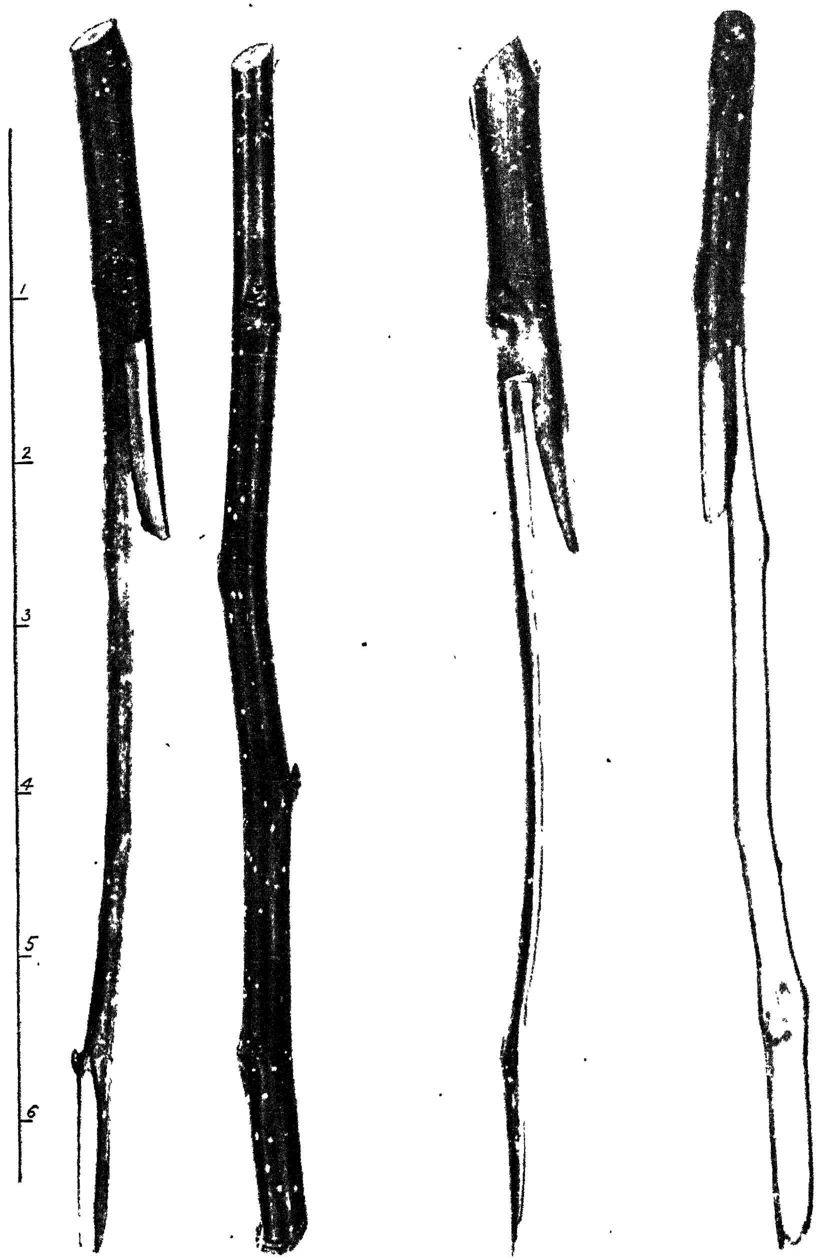


Fig. 18.—Scions ready for Strap-grafting.

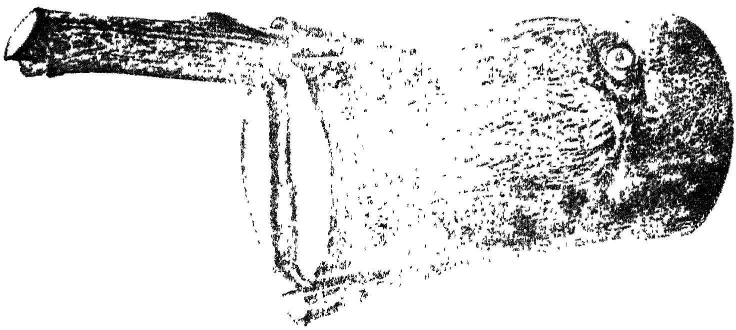


Fig 19.—Strap-grafting; the scion in place before being tied

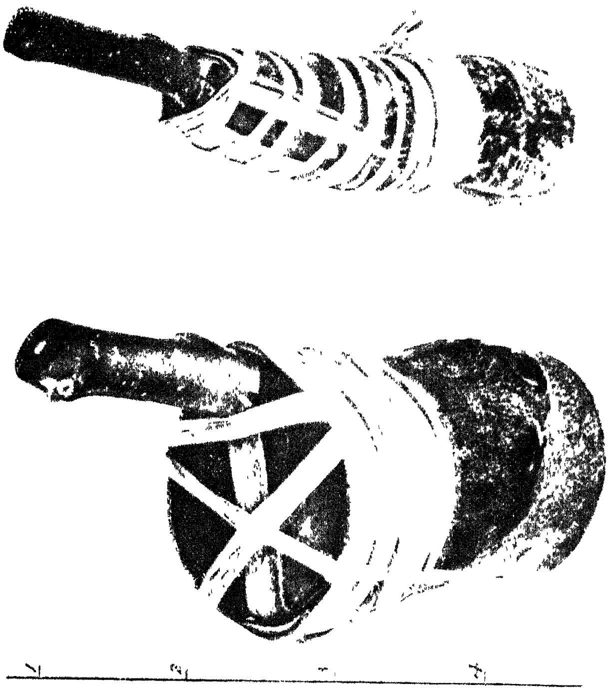


Fig. 20.—Strap-grafting; scions tied and ready for claying

Fig. 21.—Strap-grafting; scions tied ready for claying

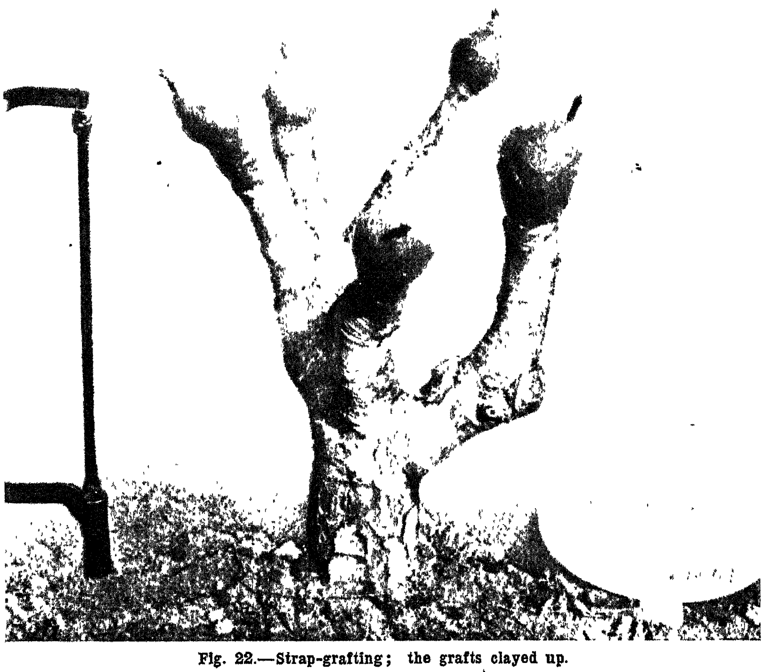


Fig. 22.—Strap-grafting; the grafts clayed up.

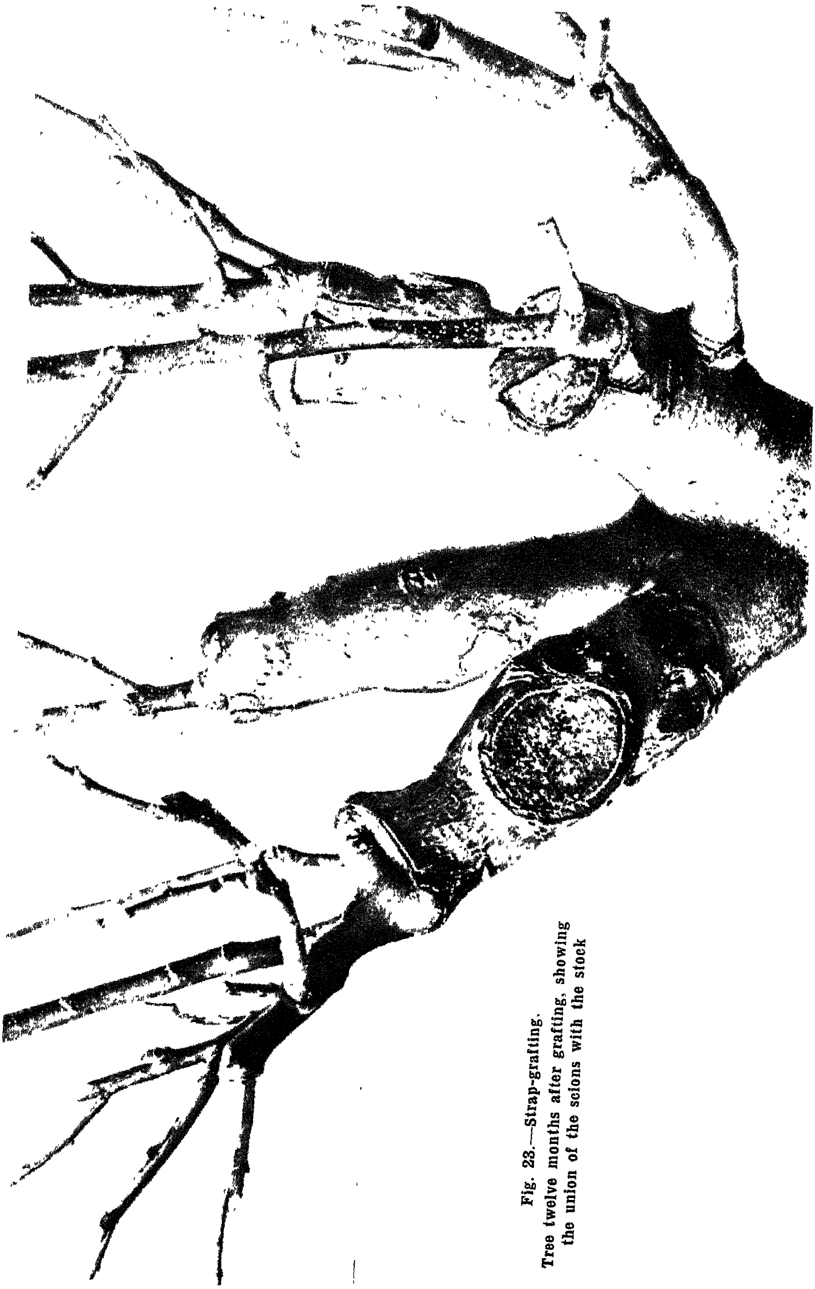


Fig. 23.—Strap-grafting.
Tree twelve months after grafting, showing the union of the scions with the stock

growing in different parts of the State, and are usually more ornamental than useful, unless it be for shade purposes.

Fig 18 shows scions ready for inserting in the tree. It will be seen that one side of the scion is much longer than the other. This long piece is to

Fig, 24.—Tree twelve months after grafting by the ordinary bark graft, before pruning.

extend over the cut limb, and part of it is inserted under the bark of the limb on the opposite side, while the short end is slipped under the bark directly under that portion of the scion on which the buds can be seen.

Fig. 19 shows the scion in place preparatory to being tied with raffia.

Figs. 20 and 21 show scions inserted in stock and tied with raffia ready for claying.

Fig. 22 shows how the same grafts look after they have been well packed around with clay. The latter takes the place of grafting wax, which is used by some, and which prevents the air from penetrating the cut parts of both scion and stock and the consequent drying out. Whenever this work is

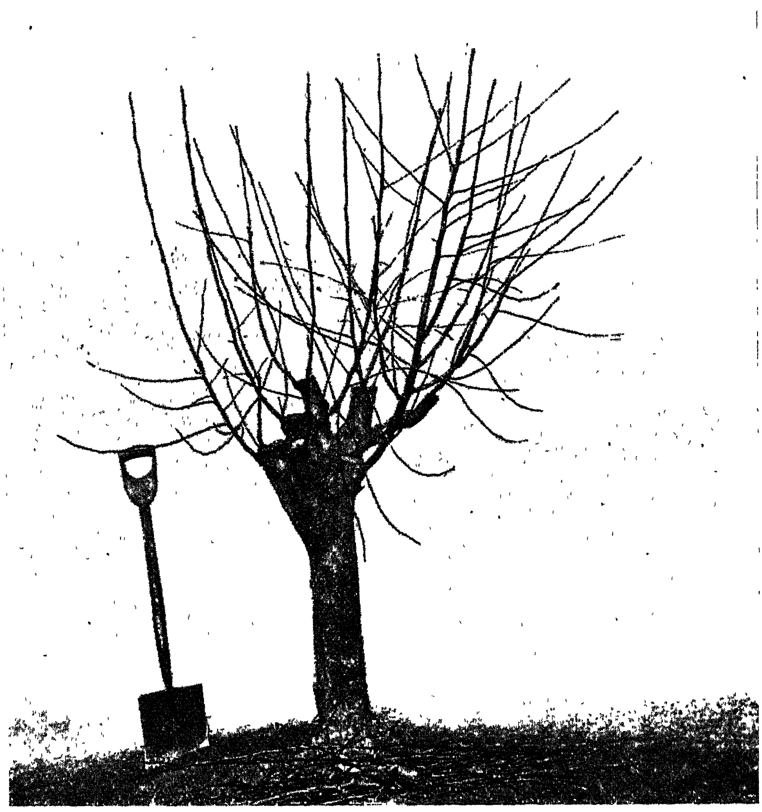


Fig. 25.—The same tree as Fig. 24, after pruning.

faithfully performed, there is very little danger of the grafts not taking; and the points to be remembered are:—

1. The stock and scion should fit perfectly.
2. The limb in which the scion is inserted should be tightly bound with raffia as shown in Figs. 20 and 21.
3. The whole should be carefully covered with a ball of clay, tightly packed around the scion and cuts in the limbs where the scions are inserted, so as to exclude the air.

Young apple or pear trees, it will be found, are easily worked in this way, but peach-trees will be somewhat harder to graft, and it is not uncommon to find a fair percentage which do not live.

Fig. 23 shows a tree twelve months after being grafted by this method. The union of the scion with the stock can be plainly seen.

Fig. 24 shows a tree twelve months after being grafted by the ordinary bark graft, and before it was pruned.

Fig. 25—The same tree as shown in Fig. 24, after pruning.

Cleft-grafting.—Trees are worked in precisely the same way as the grape-vine, except that the latter is grafted just even with or a little below the ground, while the tree is usually worked close to where the main branches leave the trunk. These limbs are split, and the scion made wedge-shaped, with the outer edge a little thicker than the inner one (Fig. 26), so that the stock will hold it firmly at the point where the union must take place. It is as well to have one bud of the scion just above the wedge-shaped portion. From two to four buds are quite enough for any scion. After the two scions have been inserted, it is as well to tie the stock tightly, and then cover the split between the scions with waxed cloth, after which the stock, where cut off, and the tips of the scions, as well as the wedge-shaped part of the scion on the outside, must be well waxed over, so as to exclude the air and prevent it in any way coming in contact with the scion, or that part of the stock adjoining the scion.

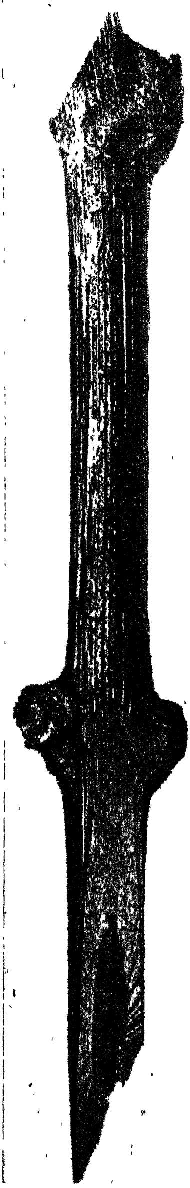


Fig. 26.—A grape-vine scion prepared for cleft-grafting.

Fig. 27 shows a grape-vine before cutting back, preparatory to grafting. The earth is thrown away from the butt of the vine, the top cut off, and the stock split ready to receive the scions. Fig. 28 shows the vine grafted and ready for covering up. A piece of waxed cloth is placed between the scions, the stock is then bound tightly with raffia, binder-twine, or waxed cloth, after which the soil is drawn back to the vine, so as almost to cover the whole scions.

In Fig. 27 will be seen the wooden mallet used for driving the grafting-knife into the stock, in order to open it ready to receive the scions. The

cleft is held open with the small prong on the other end of the knife while the scions are being put in place. The scions for the vines are cut in the shape shown in Fig. 26.

27.—A grape-vine before cutting back for grafting—marked where it is to be cut off.

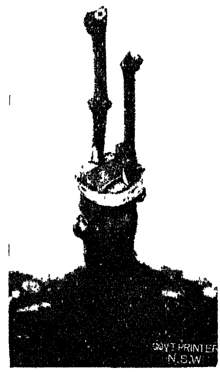


Fig. 28.- A grape-vine with grafts in position.

The stock is actually in a hole made by throwing back the earth. When filled in again the soil reaches to the top bud of the scions.

Grafting-wax.

The following is a good recipe for preparing the wax, the chief object of which is to exclude the air from the cuts on both stock and scion, and in this way to prevent the scion or the wood of the stock with which it comes in contact from drying before the union is effected. The wax should not be made so hard that it will crack after being applied :—4 lb. of resin, 2 lb. of beeswax, 1 lb. of mutton tallow. Dissolve over a slow fire, and apply warm with a small brush. If it is found necessary to apply this with the hands, it is best to keep them well greased, so as to prevent the wax from sticking to them.

Some Neglected Sheep Diseases of New South Wales.

MAX HENRY, M.R.C.V.S., and A. E. MASSY, M.R.C.V.S.

IT has for some time been recognised that there occur in various parts of this State diseases amongst sheep which are responsible, at times, for very serious mortality within the localities affected; a mortality in fact, so severe as to make it doubtful if sheep can profitably be kept on these areas. Owing largely, however, to the unfortunate fact that many stock-owners and farmers, instead of encouraging the investigation of disease, do all in their power to discourage it by concealing, as far they are able, the knowledge that mortality has occurred, it has not been possible to investigate these affections. Other factors, such as the poor support generally given to all matters appertaining to veterinary knowledge and the investigation of diseases amongst stock, must also be considered as tending to this neglect and to our present state of ignorance concerning the diseases referred to. However, since the formation of the present Department of Agriculture the veterinary staff has been largely increased, and, as a result of opportunities given them by a few public-spirited farmers, the officers composing it have been enabled to carry out some initial investigations, which it is hoped, with the assistance of the officers of the Bureau of Microbiology, may be carried further, possibly to a successful issue.

So far nothing more has been done than to collect information, and note the character and scope of the affections, but it would seem desirable that what is known about them should be placed on record as giving a basis for future investigation, and in order to create an entity for this State. As will be seen later, these diseases are not apparently fresh entities, but owing probably to the influence of climate, soil, &c., they do show certain manifestations which in some cases would differentiate them to some slight extent from what, at first sight, would appear to be identical diseases existent in other countries. Of the three affections dealt with herein one only, so far as is known, has been previously reported in this State. All three, however, are apparently closely allied to existing diseases in other States.

BLACK DISEASE.

Of the three affections referred to, that known as "black disease" has already been the subject of some investigation since as early as 1896. Mr. C. S. Pottie, M.R.C.V.S., furnished a report, which was incorporated in the Annual Report of the Stock Branch for 1896, under the heading of

"The New Sheep Disease." In the course of his report, which deals very fully with the scope, symptoms, and post-mortem appearances found, Mr. Pottie says:—

> I do not intend to advise any name to be given to this disease, unless we follow in the steps of our forefathers, and call it "Braxy."

In 1900 there appears to have been an outbreak in the Bombala Pastures Protection District, where it was referred to as "liver rot," and from then onwards it has been successively reported from the following southern districts:—Cooma, 1901; Bibbenluke, 1902; Germanton, 1907; Woodhouselee, 1908; Braidwood and Fullerton, 1909; and Brewongle, 1910. But there is no doubt that in most cases it had been endemic in these districts for some years previous to official report being received. Its present distribution may be taken to extend over all the districts mentioned above, and there is some evidence that fresh districts are slowly becoming infested.

Sheep of both sexes are attacked, principally 4 and 6-tooth and full-mouthed, lambs and weaners being apparently exempt. It occurs chiefly during the autumn and winter months, from May to September, and recurs annually; but, judging from information gathered by one of us (Henry) during an investigation at Fullerton, the mortality is less in a hard, frosty winter, and greater in a mild, wet one.

All the information gathered tended to show that the disease is spread by moving affected sheep; not by direct contagion from sheep to sheep, but by general contamination of the country. Sheep introduced into the affected area from without show greater susceptibility than those reared in these areas.

The symptoms are slight. In some cases straggling after the flock, loss of appetite, and general depression are noted for, possibly, forty-eight hours before death; but, as a rule, sheep seen perfectly healthy in the evening are found dead on the camps next morning, a few dying off each night. On post-mortem examination the carcases are generally in good condition, but are noted to become rapidly distended with gas, and to putrify with extreme rapidity; the skin and subcutaneous tissue somewhat ecchymotic; a considerable quantity of peritonial fluid; rumen, reticulum, and omasum normal, abomasum sometimes showing slight congestion, in a few cases deep congestion; intestine somewhat congested and distended with gas; spleen usually somewhat enlarged and softened; liver usually soft, friable, and enlarged, sometimes intensely congested, and in other cases showing slight necrotic areas; gall bladder distended with bile, and the bile darker and thicker than normal. The lungs are often slightly congested, and there may be some pleural exudate. The pericardial sac usually contains a fair quantity of clear, pale, straw-coloured liquid. These appearances are, however, by no means constant, and often very slightly marked. The animal usually dies without a struggle.

Curative treatment has been attempted without avail, and an effort was made, based on the supposition that the disease was Anthrax, to protect the sheep by the use of Anthrax Vaccine, but without success.

Mortality is often diminished by moving the sheep off affected country on to clean pastures, and this eventually tends to spread the disease. In many instances no effort is made to destroy the carcases of those dying, and in this way the prevalence of the disease is probably maintained.

Similar Diseases and Comparisons.

Malignant Transudation (Gilruth).

A report on this disease appeared in the *Agricultural Gazette* of Tasmania for January, 1910, and a perusal of that report very strongly suggests that it is, if not identical with "black disease," at any rate very closely allied. The absence of noted symptoms, the extremely rapid distension and putrefaction of the carcases, the good condition of the animals affected, and the post-mortem appearances in general are all indicative of "black disease," though the age incidence appears somewhat different, being confined in the Tasmanian case to hoggets, while in "black disease," so far as is known, sheep about 20 months and 2 years old are principally affected. In the course of his report, Professor Gilruth says:—

> The disease is neither infectious nor contagious in the ordinary sense. It is unlikely that it is ever transmitted from an affected living sheep to a healthy animal. The bacillus, like those of Black-leg, Anthrax, and Malignant Œdema, probably has its normal life in the ground, and, so to say, only becomes parasitic by accident. While this is true, there is no doubt that the carcase of an animal dead of the disease must become a potent source of fresh infection.

This is entirely borne out by our observations in this State. It may be mentioned that Dr. Wilmot, Government Veterinarian of Tasmania, regards this disease as identical with "braxy."

Professor Gilruth, in his description of a causal organism, gives it as being a short rod often found in pairs, non-motile, sporulating generally at one end, but often in the centre. Gram positive, strictly anaerobic, growing readily in blood serum, and in artificial media to which serum is added, when distinctly alkaline and air excluded rigorously, but refusing to grow in neutral or acid artificial media. In size it is fairly constant, being from 4 to 6 microns in length, and ·5 micron in breadth. Rapidly fatal to guinea-pig, rabbit, pigeon, rat, and sheep. In young sheep under a year old death occurs in from eighteen hours (with a dose of ½ cc.) to thirty-six hours (with ¼ cc.) of a culture a few hours old. In sheep 18 months old, even with smaller doses, death occurs within forty-eight to sixty hours.

Braxy-like Disease in Sheep in New Zealand.

This affection was also reported on by Professor Gilruth in the Reports of the Department of Agriculture for New Zealand, as affecting hoggets fed on turnips; and in age and seasonal incidence, condition of affected animals, lack of symptoms, and post-mortem appearances, it is stated by him as most closely resembling the disease found in Tasmania, and known as Malignant Transudation. Here again a description of the causal organism is given as

follows:—Short bacillus, gram positive, anaerobic, half the size of anthrax, though varying from a small cocco-bacillus to a bacillus as large as that of anthrax, sporulating, though slowly, in cultures, frequently in pairs, producing generally little gas and no offensive odour.

There was in neither of the diseases in question the ulceration and inflammation of the abomasum noted in braxy, whilst in black disease there was merely some more or less severe congestion, in some cases hardly perceptible.

BRAXY

Affects sheep under 1 year of age, occurring in the winter months, and found endemic in certain well-marked areas in the West of Scotland and England. Sheep in good condition are mostly affected. Symptoms are seldom noted, the sheep die without sign of struggling, and the carcases bloat and putrify with great rapidity. There is general effusion of liquids into the serous cavities and the subcutaneous connective tissue, but no œdematous fluid into the muscles or substance of the various organs. The serous effusions have often a muddy aspect, and evoke much gas. The abomasum is usually empty and contains blood-stained mucous; mucous membrane often congested, and sometimes distinctly ulcerated, and even showing gangrenous sloughs. The spleen seldom shows morbid change, but the liver and kidneys may be softened and friable, the latter becoming of a greyish hue, with the capsule semi-detached. Carcases of sheep dying from this disease have a characteristic odour.

In the report of the Departmental Committee appointed by the Board of Agriculture to inquire into Braxy and its allied diseases, a causal organism is given as being isolated from the peritonial fluids, which, according to Professor Gilruth, presents a number of points of similarity to that found by him in Malignant Transudation, but differing in the odour of cultures, virulence of cultures for guinea-pigs, and even for sheep.

A CHOREIC DISEASE OF SHEEP.

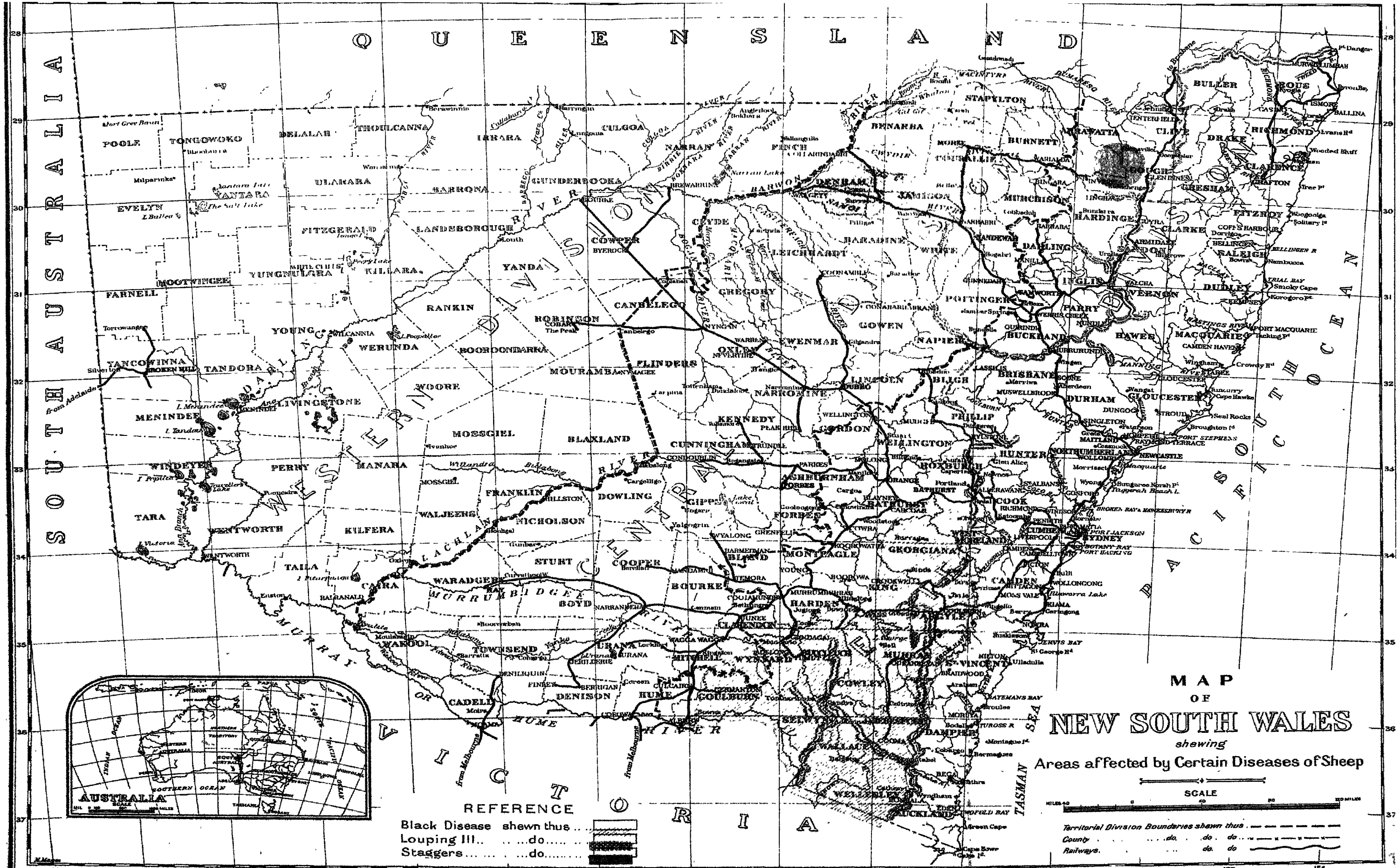
Louping Ill (?) (*Chorea paralytica ovis*).

The second of the affections with which we are dealing has not so far, to our knowledge, been recorded for the continent of Australia, but was the subject of a minute by Dr. Wilmot, Government Veterinarian of Tasmania, as being somewhat prevalent in that State. Although it may be considered premature to ascribe any designation to a disease of which so little is known, yet the whole characteristics of the affection so fully answer the description given by various authorities, and tally so closely with the disease as observed in Scotland by one of us (Massy), that we have ventured to ascribe to it the nomenclature observed by Hamilton in the Departmental Reports of the Board of Agriculture for Great Britain. The disease, as it occurs here, has been the subject of investigation quite recently by one of us (Henry), in conjunction with Dr. Cleland, of the Bureau of Microbiology, acting under

instructions from the Chief Veterinary Officer (Mr. S. T. D. Symons, M.R.C.V.S.) and the Director of the Bureau (Dr. Tidswell). So far as is at present known, it occurs only on circumscribed areas of the north-west, principally in the basin of the Namoi, and in that area has coincided almost exclusively with country which is subject to floods. It would appear to have been first observed to any extent after the flood of 1908, and has since recurred after any rainy period, gradually subsiding and dying off in the intervals. After the flood of 1910 it recurred with greater severity than usual, and has, in some places, continued up to the present time, in spite of the prevalent dry weather. There appears to be no evidence to show that the disease is spreading. The country consists of black soil plains, with some sandy ridges, and is fairly well timbered. Feed at the time of investigation was scarce, and what was available was burnt and dry, consisting principally of Nardoo (*Marsilea* sp., *Marsiliaceæ*, Maiden). The disease attacks animals of all ages from a fortnight upwards, wethers, ewes, and rams. The duration of the illness varies from a few hours to a week or ten days, but the course of symptoms appears constant. The first symptoms observed were a pricking and trembling of the ears, raising of the tail to some slight extent in lambs, and trembling of the limbs when standing still. As the disease progresses the sheep stands apart from the flock, standing rigid, with the head held high; appetite is lost; the eyes are half shut, but attention can be attracted, and the head will be turned and the eyes opened; the animal moves with rather jerky action and some loss of control, most marked in the hindquarters, will move a few steps, and then stand swaying slightly from side to side with limbs quite rigid. In a more advanced stage the sheep stand with head outstretched, champing the jaws, and will not move until a hand is placed on them, when they move away, showing evident lack of control over the hindquarters, and will run into any obstacles, such as logs, trees, &c., that may be in their way, and stand against them with head held high, breathing quickly, and with twitching of the muscles of the nose and face. They appear later to lose the power of standing, and lean against fences, posts, &c., but at last lie down, with legs stretched out, head drawn back, and sometimes a little to one side; the breathing is rapid and often jerky and noisy. At intervals they kick and struggle convulsively, the ground all round being greatly disturbed. The pulse is rapid, but the temperature is often normal. At other times, especially if touched, the limbs are seized with tetanic-like spasms, the head is drawn far back, and the teeth are ground together. No notice is taken of a threatened blow, and the eyes are kept wide open. The convulsive fits become gradually less and less intensive, and the animal dies usually stretched out with the head back.

There is no undue distension of the body with gas, nor unduly rapid putrefaction, though on occasions there is seen a frothy, blood-stained discharge from the nostrils.

The post-mortem appearances cannot be described as marked. The carcases are well nourished, not anæmic; there is often no marked peritoneal fluid, but may be a little clear, pale liquid, no ecchymosis or œdema of


MAP
OF
NEW SOUTH WALES
shewing
Areas affected by Certain Diseases of Sheep
SCALE
REFERENCE
Black Disease shewn thus
Louping Ill .. ...do.....
Staggers ... ...do.......
Territorial Division Boundaries shewn thus
County ... do. do. do
Railways. ... do. do
SOUTH AUSTRALIA
QUEENSLAND
VICTORIA
PACIFIC OCEAN
TASMAN SEA
AUSTRALIA
WESTERN DIVISION
CENTRAL DIVISION
EASTERN DIVISION
MURRAY RIVER
LACHLAN
MURRUMBIDGEE
from Adelaide
from Melbourne
to Brisbane

subcutaneous tissues and muscles. The abdominal viscera externally appear normal; the liver is usually normal, but may be somewhat light in colour; gall bladder full; spleen very slightly enlarged and perhaps a little congested, sometimes showing a few petechial spots; kidneys, bladder, and urethra normal. Rumen is usually fairly full and contents liquid; the other stomachs and intestinal contents usually normal, but may in cases be dry. This is sometimes most marked in the abomasum, at others in the cæcum and colon. The small intestine is usually empty, and contains some mixed bile and mucous. Mesenteric lymphatic glands somewhat enlarged and moist. The pericardial cavity contains more or less clear, watery fluid; heart usually normal, but may show a few petechial spots. Cranial cavity contains an excess of almost clear liquid, and the vessels of the brain are often somewhat congested. Some congestion of the trachea and nasal mucous membranes occurs. The blood is normal in colour and coagulates regularly.

The mortality ranges up to 10 or 15 per cent., but is usually much lower, and can be checked almost immediately by the removal of the affected flock on to higher, non-flooded country. Sheep introduced from non-infected districts are stated to have died within a week of being placed on the country.

As the only known affection amongst sheep to which the above condition is at all referable is Louping Ill, the following information, from the Departmental Reports of Great Britain, is given to provide some comparison:—

Louping Ill.

Etiology.—The organisms causing this disease are closely allied to those of Braxy, Black Quarter, and Malignant Œdema. They are rod-shaped, spore-forming, and anaerobic; artificial media most suited to their growth being alkaline glucose beef-tea, and glucose gelatin covered with oil. Gas is germinated, with a distinctly putrefactive odour.

The dimensions of the organisms vary, owing to involution forms being constantly present. Their natural habitat is the intestinal canal. When they pass through the intestinal wall and begin to germinate on the liquids and tissues of the body, the peritoneal cavity is first invaded, and from it almost pure cultures can always be obtained.

In all the above diseases—*i.e.*, the Braxy group—that the particular organism is found in the peritoneal fluid is not generally recognised. Repeated attempts to obtain the organism from the blood, œdematous liquid of the subcutaneous tissues, the hæmorrhagic muscles, and elsewhere, have failed.

Semiology.—An animal may be found lying on its side motionless, and in a semi-paralysed condition. At other times, on examining a flock of sheep, some are seen to have an uncertain gait while moving, and if suddenly approached will fall over, arise with an effort, or, if helped up, will continue feeding.

Complete paralysis is sometimes present, the animal having no power in the limbs, even when held up and supported.

Movements of the head are peculiar when the animal is lying, it often being jerked from side to side, and occasionally thrown right back, with rolling of the eyeballs. In some cases the head may be flexed and twisted to one side and rest firmly on the ground.

Constipation is sometimes a symptom, the fæces being hard and dry, and sometimes blood-tinged. Frequently there is diarrhœa, the animal scouring

badly. In cases which have been under close observation, it has been found that the temperature varies from subnormal to as high as 109 degrees F. Pulse varies, sometimes weak, sometimes full, sometimes not easily taken owing to the tetanus-like rigidity of the muscles; fifty to 140 beats per minute are recorded.

Respirations may be shallow, thirty per minute, or quick, sharp, and gasping, accompanied with considerable noise, and ranging to ninety-six per minute.

Rumination ceases throughout the entire course of the disease.

Briefly summarised, the course of the disease is much as follows:—The animal shows symptoms of general dulness, is off its feed, and is not so easily disturbed as it should be; it walks unsteadily, and tends to lean against any object with a view to support. Later the animal falls over in a helpless condition, is quite unable to gain the upright position, and develops convulsive-like spasms of the limbs. They occur without any apparent stimulus, but are exaggerated by disturbing the animal. The neck is usually drawn back during a spasmodic attack, but the jaw is not, as a rule, clenched. The nervous exacerbations differ usually from those of tetanus in the fact of their being clonic, instead of tonic, in character. Still, in certain cases the symptoms may closely resemble those of tetanus; the limbs are occasionally outstretched and rigid, the breathing becomes quick. The animal may die shortly afterwards in a state of collapse, as if under the influence of a toxic poison, or the paretic stage may develop and the animal continue to live for weeks.

Post-mortem Lesions.—The carcase may be distended with gas, the abdomen then being prominent and tympanitic; but in a good proportion of cases there is no evolution of gas. On removing the skin the surface of the carcase is usually unaltered in colour, shows none of the bright-red colour so often perceptible in Braxy, and it has rather a dry than a moist aspect.

On opening the abdomen the gas, if present, has a putrefactive odour, but this differs from that of Braxy and most other diseases which have been confounded with Braxy; it is essentially the odour of putrefaction.

There is always a considerable variation in the quantity of fluid found in the peritoneal cavity; sometimes practically none, in other cases there may be as much as a pint. The colour varies; sometimes quite clear, at other times blood-tinged, or it may be of a dark chocolate hue, and of muddy consistency.

Petechial hæmorrhages are often found under the serous coat of the intestine, and lying on the mesentery. On opening the stomachs, they, as a rule, contain some ingesta which is moist, and the epithelium of the first three stomachs is sometimes found peeling off; otherwise they appear to be normal.

The intestines may be almost empty and the mucous membrane quite healthy, or may be slightly congested at intervals. The liver, lungs, spleen, kidneys, and heart show no pathogenic changes. The lymph glands throughout the body are often much enlarged, œdematous, and contain gas. They have been found to exhibit a greyish point as if in a condition of incipient suppuration; in some cases a hæmorrhagic appearance has been noticed.

In many cases an œdematous and blood-stained liquid has been found in various parts of the body in the subcutaneous tissue.

On exposing the brain and spinal cord, the following pathogenic changes are sometimes evident:—A jelly-like matter between the cord and spinal column; more or less congestion of the cord and its coverings, irregularly distributed. Parts of the cord sometimes described as softened, sometimes as hardened; at times enlarged, or may be shrunken. The brain congested, and an increase of the cerebro-spinal fluid.

Following on the discovery of what was believed to be the causal organism of Louping Ill, experiments were carried out by the Departmental Committee with a view to preventive inoculation, but although favourable results were obtained, no general method has yet come into vogue.

STAGGERS IN SHEEP, GOATS, AND CATTLE.

In November, 1908, a report was received from Mr. Stock-Inspector St. Clair with reference to a mortality amongst young.goats in certain parts of New England.

This forms the third of our series of neglected diseases, since it has been noticed amongst the stock in the district for some years, but has never been previously reported.

One of us (Henry) was detailed to investigate, and it was found that, in contradistinction to the two first-mentioned affections, not only sheep, but goats, cattle, and, it is stated, horses, have succumbed to this disease. The country involved was stony and ridgy, fairly well cleared and rung. It was, as far as the farm to which most attention was given, and on which the mortality was most severe, is concerned, first rung in May, 1908, and stock were first put on to it in the November following. Mostly young stock were affected, but cattle up to 18 months and over were not immune. Females, entires, and castrated males all suffer. The disease appears to be most prevalent in spring and early summer.

The first noticeable symptom is that the animal stands with the back arched, swinging the head gently up and down. There is a stiffness of the hind-quarters on movement, and some tympanites. At times, especially if made to run, the animal falls down in convulsions; then the legs stiffen, and the animal roars as if in pain. If handled, the spasms gradually decrease until the animal lies still, but so long as any disturbing element is present it appears quite unable to control its movements or rise. Breathing is rapid, and the animal sweats. The head is continually shaking up and down.

If watched from a distance it will soon rise and walk away stiffly, showing lack of control over the hindquarters; but if it falls in a difficult place it is unable to rise, and dies there.

The disease appears to be of a lingering nature, and may assume a chronic aspect. In such a case the animals are emaciated, the appetite is impaired, and the animals walk stiffly. If approached they run away in a curious manner, the hind legs being brought forward together in jumps, although the fore legs trot. After running a few steps they collapse, roll over on to the side, and lie kicking, with the head somewhat drawn back. If left alone they will, after a time, rise and continue feeding.

On post-mortem the carcases are fairly nourished, but slightly anæmic; the thoracic, abdominal, and pelvic viscera are normal. The brain and spinal cord are normal, though there may be slight congestion of the meninges. There is no undue rapidity of putrefaction, evolution of gas, nor discharges from the natural openings.

Such a condition has been previously described by Gilruth in the Reports of the Department of Agriculture of New Zealand, and was ascribed by him to the ingestion of the seeding heads of rye-grass.

In the *Agricultural Gazette* of New South Wales, December, 1900, a note appeared by the then Government Veterinarian, Mr. J. D. Stewart, M.R.C.V.S., on "Staggers in Sheep in the Narrabri District." Here the disease was noted in a flock of sheep feeding almost entirely on marsh-mallow and the seeds of trefoil and other herbs; they were described as in fair condition, many being fit for market. The disease affected all sheep from 4 months old upwards. But little was noticed while the sheep were at rest, but if driven some few fell behind the flock, walking in a stiff manner, with back arched and nose poked out. When driven some distance these sheep, if further urged, would throw themselves down, and after a short spell, get up and go on for a little, and then go down again. If put on their feet a trembling or shivering of the muscles of the legs was noticed. Post-mortem examinations revealed practically no abnormality.

No definite diagnosis was arrived at. Cattle are reported to have suffered on these areas, and Professor Stewart suggests that it is highly probable that the disease known as "shivers" in horses, cattle, and sheep, although at the present time attributed to different and various causes, are identical, and due to a common cause. The "shivers" in horses referred to is that commonly ascribed to *Stachys arvensis,* or "balm-weed," although in the Narrabri district a very similar condition is widely regarded as being due to the ingestion of marsh-mallow. It is interesting to note that this disease, as described by Professor Stewart, far more closely resembles that noted in the New England districts than the affection at present prevalent in the Namoi basin.

CONCLUSION.

In revising the evidence collected with regard to these three neglected diseases, we suggest that we are dealing with at least two, and most probably three, separate entities. The first (black disease) would appear undoubtedly to coincide very closely with the similar diseases described in Tasmania, New Zealand, and Scotland; the second with the disease known as Louping Ill; whilst the third (Staggers) appears to be clinically identical with an affection of stock in New Zealand. It may be mentioned that local tradition agrees with the suggested bacterial origin of Black Disease, recognising its similarity in many ways to Anthrax; but with regard to the second and third affections it almost universally regards them as due to the toxic action of some plant; and more particularly in the case of Staggers, much circumstantial evidence is brought forward in support of this theory.

As before stated, the foregoing article is written, not with a view of laying down definite knowledge, although we believe we are recording for the first time the presence of the two last affections in Australia (continental), but in order to place on record what is known to form a basis for further investigation, and to demonstrate the need for such further investigation to be carried out as soon as opportunity shall conveniently permit. It is, in fact, to some extent in progress.

Apples and Pears from Bathurst Experiment Farm to Vancouver.

In March last, the Department of Agriculture arranged, through Mr. A. Kidman, to ship a fairly large consignment of apples and pears from Bathurst Experiment Farm to Messrs. Fyfe-Smith and Soutar, 524 Pender-street, Vancouver, for disposal and report.

In all, 954 cases were forwarded, per S.S. "Marama," sailing 21st March. The varieties were:—

Apples: Rome Beauty, Monroe's Favourite, Five Crown, Granny Smith, Jonathan,—918 cases.

Pears: Idaho, Packham's Triumph, Garber's Hybrid, Keiffer's Hybrid,—36 cases.

The fruit arrived in good condition, the Jonathans being considered the best, owing to their good colour. The varieties were not sold separately.

The price obtained was 2·50 dollars (10s. 2·69d.) per case. The following statement shows the charges:—

	£	s.	d.	£	s.	d.
Gross return				487	14	7
Rail, Bathurst to Sydney ...	8	5	8			
Cartage to ship	1	17	6			
Steamer freight	119	17	0			
Demurrage	1	18	8			
Vancouver charges—						
Duty	27	0	6			
Wharfage	4	1	9			
Fruit inspection ...	5	17	0			
Customs entry, &c. ...	0	6	2			
Commission (10%) ...	48	15	5			
				217	19	8
Balance (net proceeds) ...				£269	14	11

This is equivalent to 5s. 10½d. per case, f.o.b. Sydney, or 1s. 1d. below the price obtained for a shipment of apples last year. Messrs. Fyfe-Smith and Soutar state that at the time of sale stored apples were coming in from Washington, and such varieties as Black Arkansas and Winesaps were being freely offered at the same price. They consider that if the shipment had been made a month later, the returns would have been much more satisfactory.

The firm add that larger sized apples do not bring as good a price as the medium sizes, running about 2½ or 2¾ inches in diameter.

Farm Buildings at Glen Innes Experiment Farm.

THE Department of Agriculture has recently completed a set of buildings at Glen Innes Experiment Farm, designed by Mr. Adam Brooks, Works Overseer of the Department. The plans were drawn with a view to meeting the requirements of a Government Experiment Farm of 1,050 acres on the New England highlands, devoted to mixed farming and experiment work, and at which a number of students are to be instructed in the principles of agriculture. Consequently it cannot be expected that these would form type plans exactly suitable for farmers in all parts of the State. Nevertheless the Department feels that many landholders will be benefited by way of suggestion by the publication of complete plans and specifications of some of the farm buildings, which may be varied to suit the individual locality, the lines of farming being followed, and the materials available. The approximate cost to the Department is given in each case; but in other localities the price of materials will be found to vary considerably, and there are many portions of the State where such buildings could be erected much more cheaply. For instance, there is no hardwood timber in the vicinity of the Glen Innes Farm, the native timbers being chiefly white gum and peppermint. The hardwood used in these buildings had to be carted 36 miles to the farm. Again, the coarse basalt metal which had to be used for making the concrete necessitated a large proportion of sand, in order that the cement should bind. The proportions actually used were 1 yard metal, $\frac{1}{3}$ yard sand, and 3 bags of cement, to make a cubic yard of concrete. Sand had to be brought from the Mann River, 16 miles away, and cost 13s. a cubic yard. The price will, of course, prevent concrete from being largely used in the Glen Innes district, but in other localities the cost of materials is very much more reasonable.

The buildings of which plans and specifications are given in this issue are the stables, barn, coach-house, and shearing shed, all under one roof; the implement shed and foreman's storeroom combined; and the hayshed. Other buildings recently erected are manager's cottage, workmen's quarters, fruit packing-house (almost a duplicate of that at Bathurst Experiment Farm), boiler-house, piggery, cowbails, and dairy. Plans and specifications of these may be given later. All the buildings are on concrete foundations, and have cement floors, with the exception of the stalls in the stable, which are partly of wood blocks laid on cement.

Buildings now under construction are the students' quarters, to accommodate twenty students, and three cottages, for the foreman, orchardist, and herdsman respectively.

The building now complete have all been erected by day labour, under the supervision of Mr. Alex. Brooks.

Stables Block.

Approximate cost, £650.

Two special features of this block are the facilities afforded for feeding the horses, and the fact that the barn may be readily converted into a shearing shed. The latter is only a temporary arrangement at the Experiment Farm, but the design as it stands is suitable for a small mixed farm, where the expense of erecting a shearing shed would be obviated. Of course, a little extra trouble would be involved in clearing the barn at shearing time.

Chute doors for the sheep and shearing machine fittings are provided in the barn, and yards are constructed outside the building in the ordinary way.

The beam carrying the shearing machine shafting was fixed directly on to the framework of the outer wall; but on account of the vibration caused, it was found necessary to securely fix, at the driving end, a 6 inch x 5 inch hardwood diagonal stay, from the height of the beam to a sill piece on the ground, the two being securely bolted together. This has proved quite satisfactory.

A chaff silo and grain bins are provided in the angle of the building and under the same roof. This enables the feed to be distributed both ways along the feeding passages into the mangers. It is not necessary to go in among the horses to fill the mangers.

The floor of the chaff silo is raised 2 feet above the passage floor. A truck is run underneath the floor of the silo at the door through which the chaff is emptied and distributed from the truck into the mangers.

The grain bins are constructed inside the silo, and filled from the grain elevators on the barn floor. The bins distribute their contents into three separate hoppers, from which the grain is taken to the mangers.

In warmer climates, where it may not be necessary to completely house the stock, the wall at the heel-posts need not be erected, posts to carry the roof being sufficient. This will considerably reduce the cost of the building.

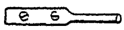
Specification for Stables Block, Glen Innes Experiment Farm.

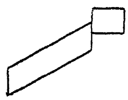
Footings.—To be about 18 inches deep by 9 inches thick, standing 6 inches above floor level, with $\frac{5}{8}$-inch bolts bedded in, as shown on detail, and where marked with dots on ground plan. The crank head of bolts to be lengthways in wall.

Sills.—Set 9 inch x 6 inch sills to all gates and doorways; at sliding doors to stand $\frac{3}{8}$ inch below floors; all others flush, and tilted $\frac{3}{8}$ inch outwards. All door studs to butt down on to sills, and the ends of bottom plates housed $\frac{3}{4}$ inch into backs of door studs. (See detail of doors).

Framing.—Corner studs to be tenoned through top halving of bottom plates and lower halving of top plates; all others through both plates, 1 inch thick tenons. All window and door trimmers tenoned through and housed $\frac{3}{4}$ inch into studs. Diagonal braces, wherever practicable, to be sunk flush into outer face of studs, and squared off and butted at ends as shown.

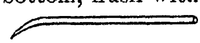
Walls.—Walls of chaff silo to have 3 inch x 1 inch cut in between studs at 35 inch centres, flush on inside face of studs, to provide nailing for edges of plain iron. Head of coach-house doors to be 6 inch x 3 inch on edge set flush on outer face. Cover the outside of studs with weatherboards, finishing at angles against 3 inch x 1½ inch batten fillets, and 1¼ inch jamb linings to all doors and windows. Cover inside of walls of chaff silo with plain iron, fixed to studs and 3 inch x 1 inch battens with clout nails.

Windows.—Shutters on barn wall to be ledged and pivot-hung on wrought-iron pivots  made of ½ inch round iron flattened out to screw to shutters, round ends working in the jambs. Sills to be of 5 inch x 2 inch



stuff, sloping, with flat piece planted on inside acting as a stop for shutter. Stable windows to be as shown, with glass over transom and fixed louvres; sills of 7 inch x 3 inch stuff.

Doors.—Loose-box doors to be ledged and hinged in two halves, upper and lower, as shown. The joint to be bevelled, so that the upper half, when fastened on the outside, secures the lower half.

Coach-house doors to be framed, ledged, braced, and sheeted, rebated and beaded on meeting styles, secured with monkey-tailed bolt into top rail inside and hasp and pin outside. Set into ground, where marked on plan, 5 inch x 5 inch stumps rounded on tops and with hooks to secure doors when open. Sliding doors to be framed and sheeted. Doors to be hung with top rollers running on ¼ inch iron bar, and against similar bar at bottom, flush with floor and fixed to inside edge of sills. (See detail). Bottom  guide iron to be sunk into top of sill at closing side of doors. Foot-strap on bottom ends of styles, ¾ inch x ⅛ inch iron, to run against bottom bar on sills.

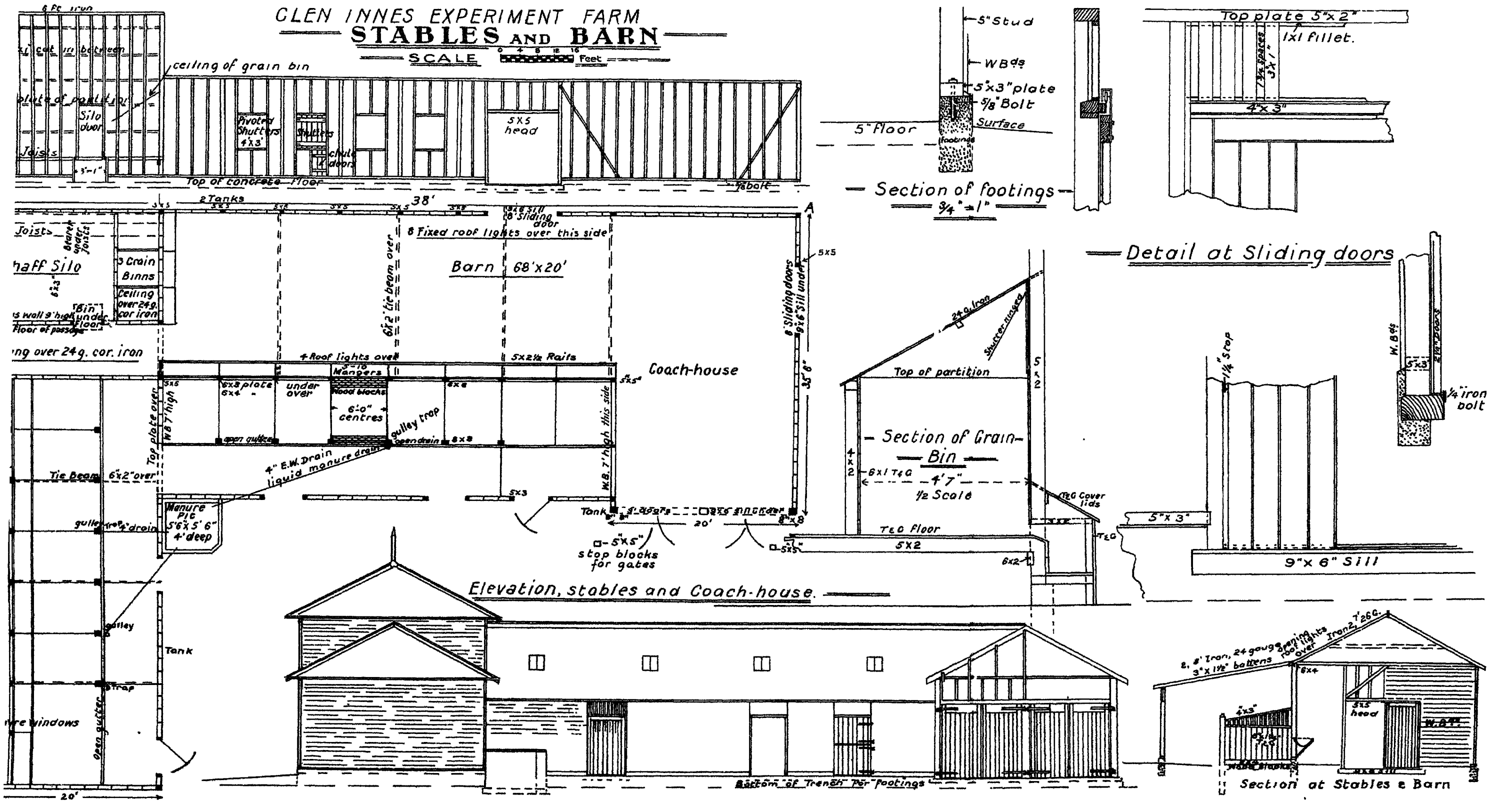
Fastenings.—Secure ledge-doors with chain pin and staple; sliding doors with 6-inch pad bolt fixed on the jambs.

Transoms.—Transoms over stable doors to be as shown in detail; 3 inch x 1 inch battens on outer face fixed upright at 1¾ inches apart. Rail to take iron bar for top rollers to be made to suit and fixed on inside of transom and across studs.

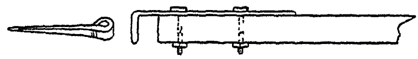
Chute Doors.—To be under shutters, made of three T and G boards ledged and hung with **T** hinges and secured inside with tower bolts (no jamb linings).

Stalls.—To be constructed as shown on section, with 8 inch x 8 inch, chamfered on corners ½ inch each way and pointed on top, leaving ¾ inch blunted. The bottom rail 6 inch x 4 inch on edge, set on floor, grooved and chamfered on top edge to receive 1¼ inch T and G boards; 4 inch x 3 inch rail on top of the boards, mortised on top at about 4 inch centres to receive 1¼ inch square balusters, fixed into groove of upper rail, 4 inch x 3 inch flat, rounded on top.

Floors of Stalls.—Floors of stalls to be wood-block paving, laid in hot tar and pitch, and sloping back 2 inches to cement gutter at outside face of heel-posts. Mangers to be galvanised iron, shaped as shown, with flanged edges, secured to under side of rails. Top of manger rails to be 3 feet


CLEN INNES EXPERIMENT FARM
STABLES AND BARN
SCALE 0 4 8 12 16 Feet
ceiling of grain bin
Silo door
Joists
Pivoted Shutters 4x3'
Shutters
chute doors
5X5 head
Top of concrete floor
¾ bolt
2 Tanks
38'
8 Fixed roof lights over this side
8' Sliding door
Barn 68'x20'
6x2 tie beam over
8 Sliding doors 9x6 Sill under
35' 6"
Joists
Bearer under joists
haff Silo
3 Grain Binns
Ceiling over 24g. cor. iron
Bin under floor
Floor of passage
ng over 24g. cor. iron
4 Roof lights over
5x2½ Rails
Mangers
Wood blocks
6'-0" centres
under over
5x3 plate 6x4
Coach-house
W.B. 7' high this side
W.B 7' high
Top plate over
gulley trap
open drain
open gutter
4" E.W. Drain liquid manure drain
Tie Beam 6x2" over
gulley trap 4" drain
Manure Pit 5'6"x 5' 6" 4' deep
gulley
trap
Tank
open gutter
windows
20'
5"x5" stop blocks for gates
20'
Elevation, stables and Coach-house.
Bottom of Trench for footings
5" Stud
W Bds
5"x3" plate
⅝" Bolt
Surface
5" Floor
footings
Section of footings
¾" = 1"
Top plate 5"x2"
1x1 fillet.
1¾ spaces 3"x1"
4"x3"
Detail at Sliding doors
24 g. iron
shutter hinged
Top of partition
Section of Grain-Bin
4'7"
½ Scale
6x1 T&G
T&G cover lids
T&G Floor
5X2
6x2
5"x3"
1¼" Strap
9"x 6" Sill
W. Bds
2½" Doors
5"x3"
¼" iron bolt
2, 8' Iron, 24 gauge, opening roof lights over
3"x 1½" battens
Iron 2' 7' 26 G.
6x4
5x5 head
W.Bds
Section at Stables & Barn

3 inches over floor of stall. Mangers of stalls towards barn to be supported on struts from front rail to bottom plate, as shown on section; on the others the inner rail is to run through the $1\frac{1}{4}$ inch boarded divisions. Dividing bars in loose boxes to be supported at head posts with hook and eye, and hung from collar tie with rope. Studs at end stalls to be weatherboard, 7 feet high.



Roof.—To be pitched and hipped as shown, except over stalls against the barn, which form a lean-to to the barn roof. Rafters at 3 feet centres, over alternate studs; collar ties to each pair, and 4 tie beams where indicated over barn. Cover spaces between feet of rafters on chaff silo roof only with wire netting. Set in roof lights, as indicated on plan, trimming battens as required. Battens for flat roof to be 3 in. x $1\frac{1}{2}$ in., others 3 in. x 1 in., fixed at about 32 inch centres.

Chaff Silo.—Walls framed and covered externally as already specified, and internally with plain galvanised iron. Floor to be raised 2 feet above stable floor, constructed with 5 in. x 2 in., notched $\frac{3}{4}$ inch into studs to take ends of joists, and 6 in. x 3 in. centre bearer, supported at centre on concrete pier. Trim opening 3 feet 2 inches wide under door in passage to take feed tank, 3 feet wide, under joists. Bottom of tank to be 12 inches under floor level, set on concrete. Door to be fitted with small sliding shutter on face, sufficiently large to allow shovelling through, at floor level. Leave opening under ridge-board in wall, over grain bins, to admit head of chaff elevator, as will be directed.

Corn Bins.—To be constructed as shown on section detail, divided into three compartments. Opening at top of front to be 6 feet 6 inches long, with shutter opening inwards to head of elevator. Opening at bottom full length to allow grain to fall into feed-boxes. Cover of these may be in one or three lengths.

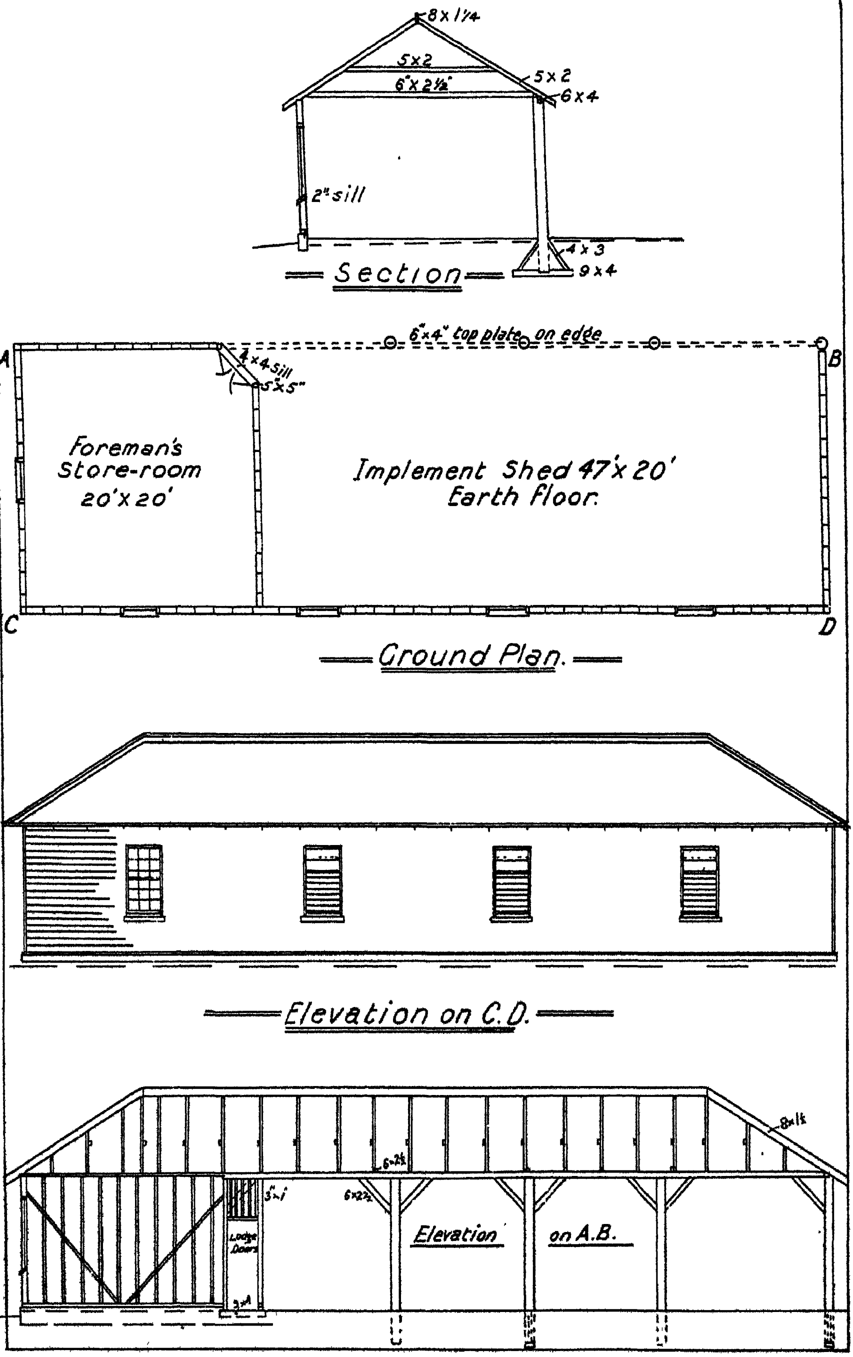
NOTE.—Ceiling over passage-way to be covered with galvanised roofing iron, 24 gauge, 8 feet sheets, fixed to plates as shown at each end, and secured on joints with $\frac{3}{4}$ in. roofing bolts.

Galvanised Iron Work.—Cover roofs, allowing double lap at sides, and 6 inches at ends, fitting close to ridges and hips, and fixing with plenty of screws and washers.

Where stable roof butts against silo walls, beat out flat and turn edge of iron up at least 4 inches against studs and under weatherboards, fixing to a batten sunk flush on the rake of roof. Fix guttering with one bracket to each rafter; joints soldered both sides, and riveted on bottom with two rivets each joint. All outlets to down-pipes to be domed over with $\frac{1}{2}$ inch wire netting. Down-pipes to be as will be arranged for tanks.

Flash round finial with plain iron tacked to finial, sunk flush and painted. Fix ridging to battens parallel with hips, boxing in open ends of rolls, and turn flanges under eaves of iron.

GLEN INNES EXPERIMENT FARM
IMPLEMENT SHED AND FOREMAN'S STORE ROOM



Painter.—Paint the whole of the weatherboards with red oxide and Venetian red mixed; the jamb linings and feet of rafters cream colour; the doors, gates, shutters, &c. olive green. Doors only to be painted inside.

Cement Floors.—The whole of the floors, except the raised floor of silo, to be laid with 4 inches thick concrete, laid in convenient separate sections, and finished with ½ inch thick top dressing. Joints of sections to be arrised off, forming V-joints between blocks. Concrete under wood-blocking of stall floors to be without top dressing, and kept low enough to take 1 inch of sand under blocks. Floors of stalls to be laid with 4 inches long 6 in. x 3 in. hardwood blocks, ends up, on sand bed, dipped in hot tar, and laid close together.

Harness Fittings.—Fit up saddle and other harness racks as will be directed, to be fixed on studs of outer walls and head-posts.

Manure Pit.—Construct walls and floor of manure pit where shown, of either 4½-inch brickwork in cement rendered on inside, or of 6-inch thick concrete, external corner bevelled off as shown.

Drains.—Open gutters on floor of stable as indicated, leading into traps and to 4-inch earthenware pipes to manure pit. Gutters and drains indicated on ground plan.

The other buildings of which plans are shown are implement shed and foreman's store-room combined, and hayshed. As in the case of the stables, the plans and specifications are those actually used in the construction of the buildings, so that farmers should experience no difficulty in having their own buildings erected from these plans, with such modifications as may be desired.

Specification for Implement Shed and Store-room, Glen Innes Experiment Farm.

Approximate cost, £120.

Foundation.—To be of concrete 7½ inches thick, flush on inside of framing.

Posts.—To be charred on bottom ends to 3 inches over the ground. Two to be plated and strutted as shown.

Tops to be scarfed to receive 6 in. x 4 in. top plate, and bolted with ½-inch bolts. Struts under plate to be toed into post and plate.

Door-sill.—Sill to store-room door to be 9 in. x 4 in. hardwood.

Framing.—To be similar to other building, 5 in. x 3 in. bottom plates, 5 in. x 2 in. top plates, 5 in. x 5 in. corner studs, windows trimmed with 8 in. x 2 in. sills pitched as shown, and 5 in. x 2 in. heads.

Door studs 5 in. x 5 in., shaped to take ledge door in two halves, hung on T hinges. Over transom to be filled in with 3 in. x 1 in. spaced 1 inch apart. Diagonal braces 3 in. x 1 in. sunk flush.

Roof.—Constructed with 5 in. x 2 in. rafters and collar ties, 3 only; 6 in. x 2½ in. tie-beams; 8 in. x 1¼ in. ridge, and 8 in. x 1½ in. hips. The length of rafter to suit two 7 feet sheets of iron with 6 inch lap at centre.

Iron.—To be fixed with double lap at sides, and $1\frac{1}{2}$ inches into gutters.

Gutters.—To be fixed to brackets, one on each rafter, falling to down-pipes on back wall.

Floor.—Store-room only to be concrete, top dressed, about 4 inches thick, laid with slight fall to door, finishing $\frac{1}{4}$ inch below sill.

Windows.—Two in store-room to be double hung in ordinary box frames; the others to be as shown on detail of stable louvre windows.

Specification of Hayshed, Glen Innes Experiment Farm.

Approximate cost, £110.

Posts.—To be spaced at 12 feet 6 inch centres, sunk about 5 feet into the ground, and charred from the bottom to 6 inches over the ground level. The four corner posts to be cross-footed and strutted; the centre posts footed and strutted across the building only.

Posts and struts to be toed into sole pieces.

Heads of posts to be scarfed to receive 6 in. x $2\frac{1}{2}$ in. rafters, and notched to receive foot of 6 in. x $2\frac{1}{2}$ in. hardwood struts, the latter to stand in the centre of the post and to be scarfed $1\frac{1}{4}$ inch on to side of rafter.

NOTE.—The lug on the head of the posts should be 2 inches more than half the thickness of post, which allows for $\frac{3}{4}$ inch to be taken out of the rafters.

Rafters.—To be halved together at top, notched $\frac{3}{4}$ inch deep at post heads and $\frac{3}{4}$ in. x 2 in. for 5-inch purlins. Short rafters to take gutter brackets.

Braces.—6 in. x $1\frac{1}{2}$ in. scarfed $\frac{1}{2}$ inch deep at centre crossing and at each rafter, including the foot at post heads.

Bolts.—$\frac{1}{2}$ inch bolt, nut, and washer to all crossings.

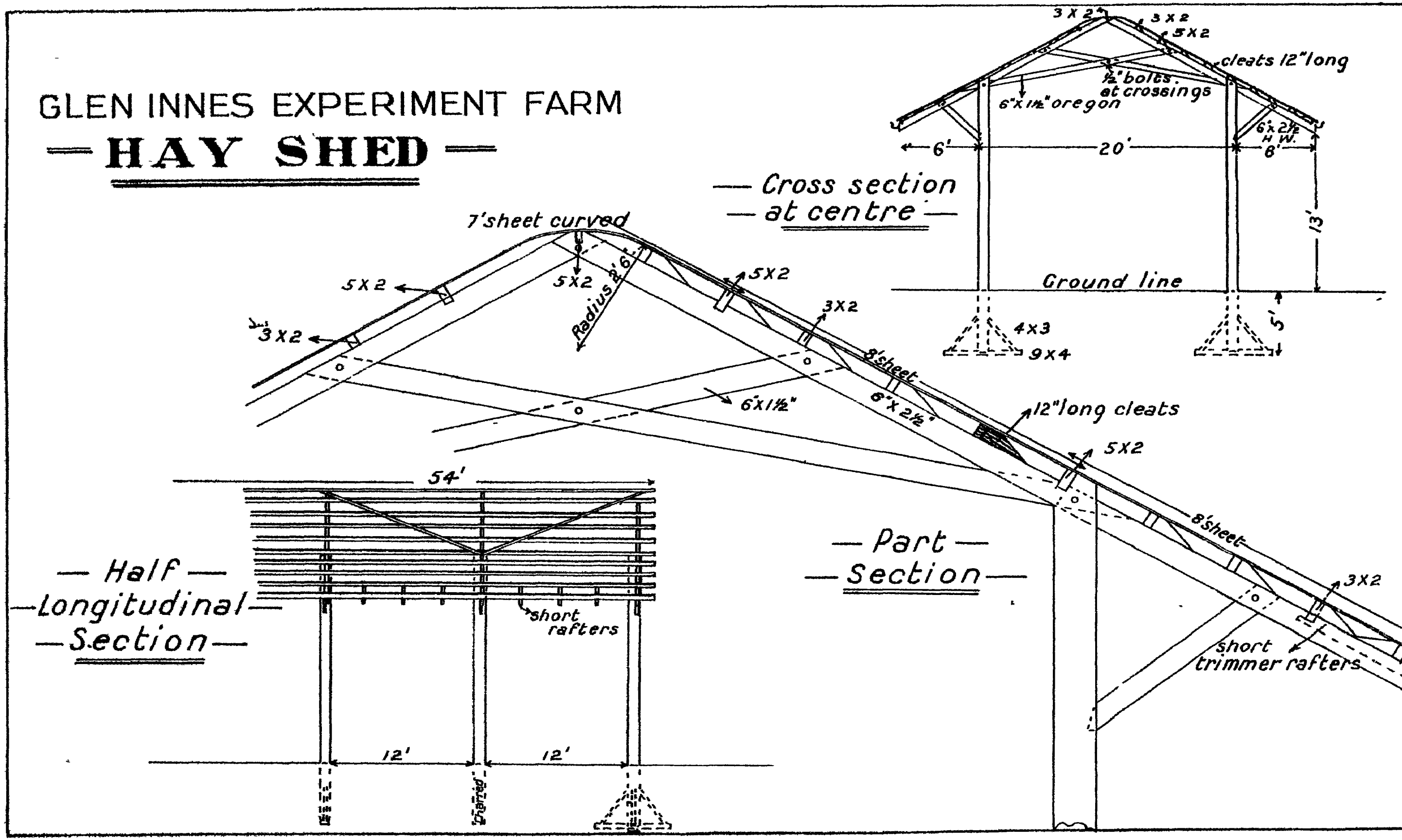
Purlins.—3 in. x 2 in. and 5 in. x 2 in., as shown, supported with cleats spiked on to rafters.

Braces.—3 in. x 2 in. diagonal braces, on flat, halved and sunk flush into top edge of purlins and butted at post heads and top purlin.

Closed End.—Fill in one end only, with 4 in. x $2\frac{1}{2}$ in. cross rails, sunk flush into face of centre post and the ends into centre of outer posts, and covered over with 8 feet vertical iron, including gable close up to roof iron.

Dressing.—Take good arrises off all sawn timbers.

Eaves Gutter.—To be fixed to deliver water into down-pipe at enclosed gable end.


GLEN INNES EXPERIMENT FARM
— HAY SHED —
— Cross section at centre —
3 X 2
3 X 2
5 X 2
cleats 12" long
½" bolts at crossings
6" X 1½" oregon
6" X 2½" H.W.
6'
20'
8'
13'
Ground line
5'
4 X 3
9 X 4
7' sheet curved
5 X 2
5 X 2
Radius 2' 6"
5 X 2
3 X 2
3 X 2
8' sheet
6" X 1½"
6" X 2½"
12" long cleats
5 X 2
8' sheet
3 X 2
short trimmer rafters
— Part Section —
54'
— Half Longitudinal Section —
short rafters
12'
12'
Charred

Productive Capacity of Dairy Cattle.

M. A. O'CALLAGHAN.

We have at the Government Stud Farm at Berry representatives of all the principal dairy breeds of cattle, and records of the milk yields of these animals have been kept for years. We have now reached a stage when cows bred on the farm are sufficiently numerous to be able to get a fair representation of the breeds, and to compare the animals bred in New South Wales with those imported. Unfortunately, owing to continued periods of drought each year during the last three or four years, we have been compelled to forego anything in the shape of a reliable test under Australian conditions of these animals. Any tests which involve entire hand-feeding are not suitable to the general conditions in New South Wales, and hence any records of that nature would be of little interest to our breeders and dairy farmers This season, however, we have had quite an average quantity of rain on the South Coast, and the pastures, though not as good as have been experienced in the old years of plenty in that district, are still quite as good as we can expect during the years to come.

It has been arranged that animals representing different breeds will be taken up and tested as the year goes on, and whenever the grass is deficient, either in quantity or succulence, hand-feeding will be supplied to the animals, so that they shall be kept in condition to do themselves justice during the milking period.

The first section to calve and be tested is one of three Guernseys, viz., the imported cow Bel Air VI, her locally-bred heifer Belle Heiress, and the locally-bred cow Calm II. A criticism of the conformation and of the breeding of these animals will thus be of interest.

Bel Air VI (Imp.).

The cow Bel Air is illustrated from three points of view. She may be classed as a typical Guernsey of a good type, save, perhaps, that her horns do not quite conform to the accepted views of what the shape of a Guernsey horn should be, and the udder is somewhat fleshy.

Fig. 1 shows the animal broadside on, and here one gets a general knowledge of her outline and symmetry. It will be seen that she is of good length—a good stamp of a breeding cow—in addition to having the required wedge-shape of the dairy beast. It will also be seen that the thigh is quite flat and in-curving, and that the teats are well placed and of good length. The flank is thin and arched high.

Fig. 2 shows the shape of the animal viewed partly from behind. Here the udder is better illustrated, as is also the shape of the hind quarters.

Fig. 1.—Guernsey Cow, Bel Air VI (Imp.).

It is seen that the hips stand out prominently, and that the tail is well set on, the brush reaching almost to the ground. This view will convey to the breeder a good idea of the capacity of the animal from a breeding point of

Fig. 2.—Bel Air VI (Imp.).

view. It is seen that she not only has length but also great breadth across the hips, and a roomy pelvic cavity. This and the previous photograph show a very well-developed milk vein of tortuous shape.

Fig. 3 gives a view of the cow directly in front, and here we can see the wedge-like formation of the beast. However, it is to enable readers to have a good view of the head that this illustration has been inserted. The large prominent eye is a specially notable feature. The well-developed nostrils and strong mouth are also in evidence. It is also seen that the face is somewhat dished, and that the head is very broad between the eyes, and the horn, although strong enough to indicate constitution, is still not in any way coarse. The reader can now look up the records and draw his own conclusions. This cow was bred in Les Tibuels Vale, Guernsey, by Mr. T. H. Mahy, and was imported in 1908 by the Department of Agriculture, New South Wales.

Fig. 3.—Bel Air VI (Imp.).

Calm II.

Let us now turn to Fig. 4, and compare the cow Bel Air with the subject of the latter illustration, viz., Calm II. I look upon Calm II as being of the best type of colonial-bred Guernsey. Here we have more robustness and greater size than in the imported animal, due somewhat, no doubt, to having been brought up on richer land.

It is a well-known fact that the typical Guernsey of the island from which the breed takes its name is finer in bone than is a similarly bred animal in England, and the same holds good with regard to Guernseys bred in New South Wales on our best country. From a dairy farmer's point of view this is an advantage, because we can do with a little more size in this breed, especially if we get an increased milk yield coupled with vitality.

No doubt most people looking at the photographs of these two cows will assume that Bel Air is a bigger milker than Calm II; but as far as these records show the contrary is the case. The udder of the cow Bel Air looks larger, but when finished milking it is larger, comparatively speaking, than is that of Calm II, thus indicating that the udder of the one has an inclination to be fleshy, whereas the udder of the other is the opposite. Calm II has given as much as 45 lb. of milk in a day without being in any way forced, whereas Bel Air has not given more than 40 lb.

The photograph of Calm II shows the animal to be of wedge shape, energetic character, very strong constitution, robust, well-covered body, with nice fine bone. The tail, it is seen, is beautifully set on, and tapers like a whip; the udder is nicely set, the teats being good and well placed. The hip stands out well, and this cow is even broader across the hips than the previous one referred to. She shows the Rose Prince type at its best,

having the great length and character which he almost always impressed on his males and females. The eye is large and prominent, the nostrils particularly large, and the mouth strongly developed. The face is probably somewhat longer than that of the previous animal, and the horns taper somewhat more, curving inwards and upwards.

Calm II is a granddaughter of the original Calm (imp.), being by the noted bull Rose Prince (imp.), from Gentle, the latter being from Calm by Masher. She is a younger sister of our stud bull Calm Prince, an animal that many good judges of dairy cattle advised me to sell when he was about eighteen months old. Needless to say, now that this cow has shown us such good results, I am not sorry that I adhered to my own opinion regarding the choice of a bull to use as the head of our Guernsey stud. This cow is dark orange in colour, and gives a milk of extraordinary richness,

Fig. 4.—Guernsey Cow, Calm II.

both in fat and solids not fat. As a matter of fact, her milk is about 33 per cent richer in solid matter than that of the ordinary good standard milk of dairy cows. If her full brother, Calm Prince, already referred to, reproduces in his progeny this capacity to yield not only a quantity of milk but a milk of extremely rich quality, we shall be able to let our dairy farmers have a strain of Guernseys which should go materially towards increasing the annual revenue obtainable from their herds.

Belle Heiress.

Fig. 5 represents the Guernsey heifer Belle Heiress, the daughter of Bel Air VI. This heifer shows considerable promise, and should, all going well with her, prove a superior milk and butter producer to her dam. The udder development is very excellent, without the tendency to fleshiness which has been referred to in her mother.

Fig. 5.—Guernsey Heifer, Belle Heiress.

Milk and Butter Yields.

Particulars of the milk and butter yields of the three cows referred to are as follow :—

Calm II gave birth to her last calf on the 19th September, 1910, and for the week ended 1st January, 1911, she had yielded 3,867½ lb. of milk, from which it is estimated 248 lb. of butter could have been made. Total milk period, fifteen weeks.

Bel Air VI (imp.) gave birth to her last calf on 25th September, 1910, and was in milk for fourteen weeks up to the 1st January, 1911. Total amount of milk yielded, 2,942 lb., which it is calculated would have made 166 lb. of butter. It is thus seen she is 82 lb. of butter behind Calm II in her yield, with only one week's difference in the length of lactation.

Belle Heiress give birth to her first calf on the 21st September, 1910. For the fourteen and a half weeks up to the 1st January, 1911, she yielded 2,651 lb. of milk, from which it is estimated 136 lb. of butter could have been made.

Whereas only a fat test was made from the milk of these cows during the first four weeks after they had calved, since 23rd October a regular weekly analysis of each cow's milk has been made, and these are of such interest that they are reproduced below. They convey two things of importance, viz., the variation which takes place in the fat test of a cow's milk without any apparent cause, and also the entreme richness, not only in fat but in solids other than fat, of the milk of Guernsey cows, but more particularly of the cow Calm II. If the solids not fat and the fat are totalled, it is seen that the cow Calm II averaged about 14·8 per cent. in the morning and 15·5 per cent. in the evening's milk of total solid matter. Some exceptional

figures are shown in the totals given—such, for instance, as 7·54 per cent. of fat in the evening's milk and a week later 4·10 per cent. of fat in the evening's milk of the cow Calm II. The Manager of the farm stated that the cow was bulling on or about the date on which the latter figures were obtained.

A very great variation is also shown in one instance in the case of the milk of the cow Belle Heiress, the morning's milk dropping from 5 per cent. on one day to 3·28 per cent. on the same day of the following week, but going back again to over 5 per cent. a week later. The deduction to be drawn from this is that this cow, Belle Heiress, had some cause of excitement which caused her to give an unusually low yield of fat on the morning in question, and no doubt her average weight of butter for the week is prejudicially affected, but it will not affect her estimated total butter yield more than a couple of lb. in the season.

The following table shows the milk yields and analyses of the three Guernsey cows mentioned during the period of ten weeks :—

Morning's Milk.	Fat.	Solids not Fat.	Evening's Milk.	Fat.	Solids not Fat.	Fat per day.	Week's Milk.	Week's Fat.
lb.	per cent.	per cent.	lb.	per cent.	per cent.	lb.	lb.	lb.
				CALM II.				
22	5·12	9·54	19	4·42	9·57	1·96	280	13·72
20	4·48	9·57	20	5·66	9·72	2·02	289	14·14
20	4·15	9·68	20	7·54	9·33	2·33	281	16·31
20	5·10	9·75	17	4·10	9·81	1·71	252	11·97
19	5·58	9·39	18	6·88	9·15	2·29	248	16·03
20	5·70	9·62	18	6·30	9·43	2·27	256½	15·89
19	5·28	9·47	16	5·98	9·76	1·95	251	13·65
18	5·65	9·48	15	6·80	9·27	2·03	233	14·21
18	5·40	9·89	15	6·65	9·66	1·96	238	13·72
18	4·90	......	16	5·78	......	1·80	236	12·60
				BEL AIR VI.				
18	4·12	9·30	17	4·40	9·02	1·48	227	10·36
18	5·08	8·83	15	5·58	9·04	1·70	231	11·70
18	4·00	8·82	15	4·50	9·16	1·37	225	9·73
14	4·78	9·26	16	4·70	9·00	1·42	204	9·94
15	4·71	8·95	14	4·71	8·98	1·36	201	9·52
15	4·26	9·19	13	5·21	8·85	1·31	202	9·17
14	5·30	9·24	14	5.30	9·14	1·48	192	10·36
14	5·05	8·92	12	5·10	9·15	1·31	189	9·17
14	5·60	8·97	13	5·12	8·95	1·44	187	10·08
14	4·59	......	13	5·10	......	1·30	186	9·10
				BELLE HEIRESS.				
15	3·85	8·98	13	4·85	8·73	1·20	186	8·40
15	4·30	9·06	13	4·30	8·84	1·20	198	8·40
15	4·48	9·30	13	4·00	8·90	1·24	194	8·68
15	4·20	9·36	12	4·70	8·99	1·19	188	8·33
14	4·12	9·35	12	4·40	9·06	1·10	178	7·70
13	4·83	8·73	12	5·00	9·15	1·22	178	8·54
14	5·80	9·16	13	4·20	9·32	1·35	180	9·45
13	5·00	9·22	11	4·65	9·12	1·16	167	8·12
13	3·28	9·08	11	4·60	9·18	0·92	172	6·44
14	5·18	......	11	5·10	......	1·28	168	8·96

GUERNSEY BULL, HAYES' CORONATION III (Imp.).

The illustration of the Guernsey bull, "Hayes' Coronation III," represents probably the best type of Guernsey bull that has left England during recent years. He has been imported into New South Wales by Mr. Anthony Hordern, who with his brother, Mr. Samuel Hordern, have recently imported a large number of stud stock of various breeds.

This bull has had an extremely successful show career; among a big lot of awards being first and champion Guernsey bull at the last English Royal Show. He was bred by Sir E. A. Hambro, of Hayes, Kent.

Referring to his conformation; his head, character, and carriage are very fine, and no doubt these traits have gone a long way towards securing him the many prizes which he has gained. Depth of body and apparent vigour of constitution are also strongly in evidence.

New South Wales Guernsey blood will be greatly strengthened by the addition of this sire, especially as Mr. Hordern has imported some very nice females to mate with him.

Fig. 6.—Guernsey Bull, Hayes' Coronation III, recently imported by Mr. Anthony Hordern.

Potatoes at Grafton Experiment Farm.

THIS last season some excellent results were obtained at Grafton Experiment Farm with potatoes grown partly to test the comparative values of certain classes of manures and partly as a commercial crop. From an area of $6\frac{1}{2}$ acres, 614 bags were harvested, the total weight of potatoes being 50 tons 3 cwt. Of these, 584 bags were sold, the prices obtained ranging from £8 10s. to £11 10s. per ton, and totalling £422 18s. 10d. net cash. The value of 20 bags kept for seed may be taken as £13, and 10 bags of small potatoes left are worth £1 10s. This gives a total return of £437 18s. 10d.; and the actual profits, allowing for rent, work out at just about £50 per acre.

The variety grown was Adirondack, and the seed was obtained from Mr. J. E. Bennett, of Bibbenluke, near Bombala.

Portion of the area was covered by 54 plots, each $\frac{1}{40}$ acre in extent, devoted to the testing of various combinations of fertilisers. This area, $1\frac{7}{20}$ acres, returned 15 tons 13 cwt. 20 lb. of potatoes, or 11 tons 14 cwt. 105 lb. per acre. The soil is rich alluvial scrub land—some of the best on the farm—of good depth, and possessing fair natural drainage. The manures were mixed with a little more than their own bulk of dry sand to ensure as even a distribution as possible, and sown broadcast some days in advance of planting. The potatoes were ploughed in.

Of these 54 little plots, the highest yield was obtained from that which received a dressing of 240 lb. dried blood, 300 lb. bonedust, and 132 lb. chloride of potash per acre. This plot gave 7 cwt. 51 lb. of potatoes, or 14 tons 18 cwt. 24 lb. per acre. Another plot, dressed with bonedust alone, at the rate of 2 cwt. per acre, gave 14 tons 8 cwt. 104 lb. per acre. Other combinations which gave excellent results were:—

- $\frac{1}{2}$ cwt. sulphate of ammonia, and 2 cwt. superphosphate.
- 1 cwt. sulphate of ammonia and 4 cwt. bonedust.
- $\frac{1}{2}$ cwt. sulphate of ammonia, 2 cwt. superphosphate, and $\frac{1}{2}$ cwt. sulphate of potash.
- 240 lb. dried blood, 300 lb. superphosphate, and 132 lb. chloride of potash.
- $\frac{1}{2}$ cwt. nitrate of soda, and $\frac{1}{2}$ cwt. chloride of potash.
- $\frac{1}{2}$ cwt. sulphate of ammonia and 2 cwt. bonedust.

All of these yielded over 13 tons per acre. The results are not regarded by the Department as decisive as to the value of any particular manure or combination, but they certainly show the advantage of using fertilisers for potatoes even on rich soils.

Blacksmithing for Farmers.

A. H. E. McDONALD, Instructor in Agriculture, Hawkesbury Agricultural College.*

THESE notes have been written in the hope that they will be of some assistance to men on the land who have much to do with iron work, and who find in the course of their work that the necessity for repairs frequently arises. I wish to gratefully acknowledge the assistance received from Mr. D. H. Reay, blacksmith at the Hawkesbury Agricultural College, in writing them.

An endeavour has been made to treat the subject in as simple a manner as possible, and to give the principles of the work rather than details, except where these were useful as illustrations. Blacksmithing consists largely of the adaptation of a few rules, and if these are understood good work will soon be possible to the beginner. No one can expect to turn out good work at once; practice enters largely into the matter; but with a little patience a fair degree of skill can be acquired.

The farmer is perhaps called upon more than anyone else to exercise his ingenuity and to meet emergencies, and in the present time of keen competition he must be in a position to help himself. He is called upon in turn to be carpenter, saddler, blacksmith, &c., and it must be admitted that farmers generally have adapted themselves well to circumstances. At the same time, it is noticeable that blacksmithing work is not taken up in the same way as, for instance, carpentry, although in the matter of time and also of money, it would mean a great saving. When the ironwork of some machine breaks, it often means a long journey to the blacksmith, and in many cases if a forge were on the farm this work could be done by the farmer himself.

Another aspect of the question is worthy of consideration. The forge has a peculiar fascination for boys, and by placing the facilities at their disposal they have a source of amusement, and through it gain skill which can be turned to profitable account. The exercise will help to develop manual skill and ingenuity, and at the same time tend to make farm life more interesting.

Forges.

These can be roughly divided into two classes—fan-blast, and the bellows forges. Fan-blast forges are either self-contained—that is, the hearth and blast are in the one forge; or the forge merely consists of a hearth, and the blast is taken from a pipe connected with a blower. The blower may deliver air to several forges, each being equipped with a valve to regulate the flow. Such forges are only used in the large machine shops.

* Now Inspector of Agriculture, North-west District.

The portable fan-blast forges, an illustration of which is seen in Fig. 1, are very suitable for farm work. They are made in different sizes, but as the farmer does not usually have to take in hand very heavy work, a medium size will be satisfactory. At the same time a larger forge gives more room for working, and metal can be heated more rapidly. It is doubtful whether it is economy to purchase one of small size, when the outlay of a little more money results in a much superior forge being obtained.

Bellows forges are the kind generally used by blacksmiths. Like the blast forges, they are made in different sizes.

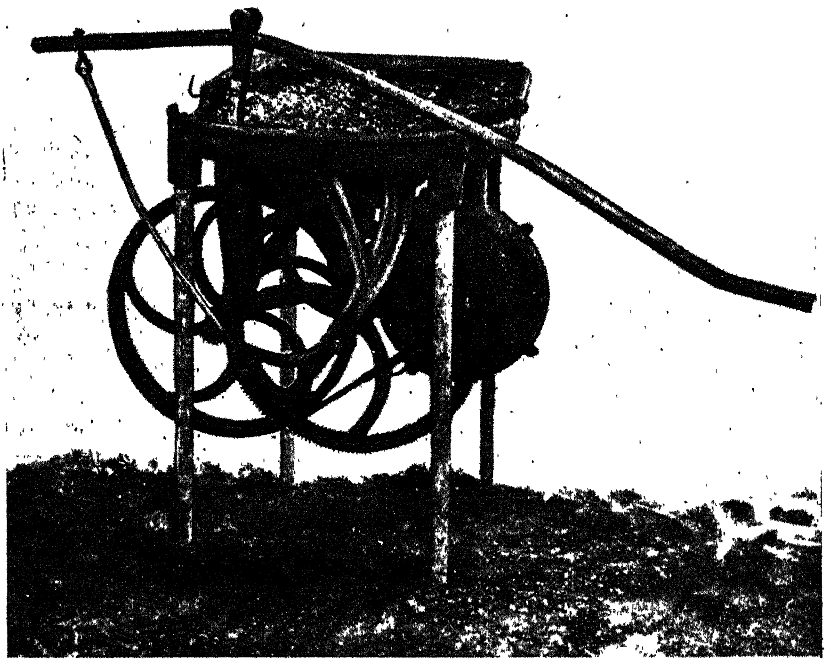


Fig. 1.—A Portable Fan-blast Forge.

Probably the portable fan-blast forge is the most suitable for farmers' purposes. The fan action produces a very even blast, and the forge has the additional advantage that, being made of iron throughout, it can be exposed to the weather without danger of serious deterioration. When bellows are used the forge must always be housed in a proper shed, or the leather soon perishes.

It is a convenience, especially to those who work on large areas, to have a forge which can be moved easily from place to place. For instance, when tanks are being excavated, or far paddocks ploughed, it is an advantage to have the forge on the spot. Unless it is portable it cannot easily be moved about.

The prices of fan-blast forges vary from £3 to £8. One with a hearth of about 22 or 24 inches square is a good size for most purposes, and costs about £5.

Smithy.

A good building is required to house the tools and protect the workman from inclement weather. If the tools are not kept together in a definite place they soon become scattered, especially when only occasionally used, and are not at hand when required. Many odd jobs for the smithy accumulate on the farm, and not being matters of urgency, are, in the rush of work, left over to a more convenient season. Wet days can be profitably filled in doing work of this class, and necessarily some shelter must be provided as a protection from the rain. Such a building should be located in a high and dry spot, as dampness causes rusting of the tools.

A suitable size is about 12 feet square and 8 or 9 feet high. The roof may be of iron or any other waterproof covering, and the sides of slabs. An opening must be made in the roof to allow fumes to escape readily.

Large numbers of tools of various descriptions accumulate in a shop after a time, and racks should be made for these so that they can be kept in a place where they can be found without difficulty.

The Tools.

The Anvil.—A solid anvil is required. A light one, or a heavy piece of iron, as is sometimes used, lacks solidity and gives too freely under the hammer. The price charged for anvils is about 40s. per cwt., and one weighing at least 2 cwt. is required. A second-hand anvil, quite suitable for amateurs, can often be obtained cheaply from a local blacksmith.

Vices.—A good strong vice is a necessity. Small vices are very well for light work, but they are practically useless for much of the work a farmer has to do.

The ordinary blacksmith's vice, known as a "tail" vice, is very good. These are generally sold by weight, at the rate of about 5d. per lb. One with a 5-inch jaw, and weighing between 65 and 80 lb., is a good workable size.

Parallel vices cost slightly more than tail vices, but they possess the advantage that a full-faced grip is obtained, regardless of the extent to which the jaws are opened.

Hammers.—Different sizes and shapes are used by smiths, but for farmers' work, a hammer weighing about 2 lb., with a ball end, is all that is required. (Fig. 2.) The ball end, or "pene," as it is called, is used in riveting, scarfing, and other work. In some hammers straight or cross penes take the place of the ball end. A straight pene is tapered, some-

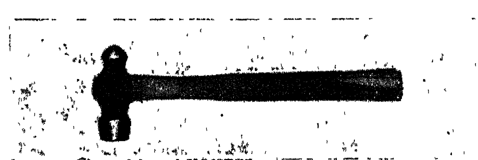


Fig. 2.—A Smith's Hammer.

what like a blunt chisel, and runs longitudinally with the handle, while a crosspene is at right-angles.

Sledges are not urgently required by an amateur, but nevertheless a sledge-hammer is very useful on a farm for many purposes. A 10 or 12 lb. sledge is a good size.

The hammers, sledges, and other tools must be firmly attached to their handles. Well-seasoned wood should be used; it is an advantage to have the wood in the shop for some time before making the handles, so that it will be well dried out. Unless it is well-seasoned the heat of the forge shrinks the wood, and the hammer head becomes loose.

The Flatter.—This tool has a broad, flat face, and is used, as its name imples, to flatten or smooth surfaces after the hammer. The hammer leaves the surface somewhat rough, and a better finish can be obtained with the flatter. Farmers, however, scarcely require this tool, as for all practical purposes sufficient finish can be obtained with the hammer.

Swages are small tools with the faces grooved in different sizes to fit over bars. Some have semicircular grooves, while others have angular ones. What are called top and bottom swages are used. They are ranged in pairs,

Fig. 3.—A Top Swage. B Fuller.

one for the top and the other for the bottom. The top swage is fitted with a handle (Fig. 3A), while the bottom one has a stem for fitting into the hole in the anvil. These tools, like the flatter, are generally used for giving a finish, and can well be dispensed with.

Instead of the single swages a *swage block* is occasionally used. This is a large iron block, bearing on its outside surface a series of grooves of varying kinds and sizes, and having its centre pierced with holes. A swage block is of little use on the farm.

Fuller.—This tool has a convex face. It is chiefly used for forming semicircular grooves or depressions in bars, and sometimes for finishing up corners where a hammer cannot be used. The rounded face does not cut the fibres of iron, but merely alters their direction. The fuller, therefore, when used to make a groove, does not lessen the strength of the iron.

They are made in different sizes. The face forms half of a circle, and the size is taken at the base of the semicircle, or what would be the diameter of a complete circle. Fullers are spoken of as ½-inch, ¾-inch, &c. (Fig. 3B).

The *Hardie* is a tool with a sharp edge, adapted for cutting hot or cold iron or mild steel. It is fitted with a stem, so that it can be held in the anvil. When a bar of iron is to be cut it is laid on the sharp edge of the hardie, a smart blow struck with the hammer, the bar moved round a little for the next blow, and so on until the bar is nicked all round. It is then easily broken by striking a sharp blow on the end, after laying the bar on the anvil with the nicked place just over the edge.

Hot and *cold sets* or *chisels* are steel tools used for cutting either hot or cold metal. They are fitted with handles and are forced into the metal with the hammer or sledge. Hot sets are kept thinner in the blade than cold sets. Cold sets must be kept thicker on account of the risk of breakage. These are tempered, but it is little use tempering the hot sets, as the heat of the metal cut by them soon withdraws the temper. (Fig. 4).

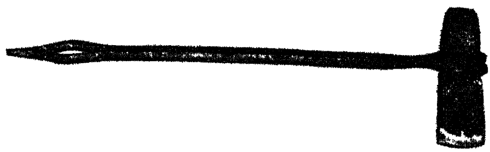


Fig. 4.—Cold Set.

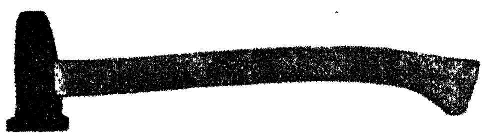


Fig. 5.—Set Hammer.

Set Hammer.—This is somewhat similar to the flatter, but is made smaller in the face. It is chiefly used for reaching those places where ordinary hammering cannot be done, as in angles. It is placed on the spot which requires working and struck with the sledge. (Fig. 5).

Punches are made circular, oval, oblong, and square in different sizes, and are fitted with handles for use.

Mandrels are slightly tapered tools used for finishing up holes after punching, shaping rings, &c. They are made in different sizes.

Bolster.—This is a steel or iron bar or block, containing holes or cavities for forming up different classes of work. The holes are round, square, and slotted, according to the class of work for which they are intended. If a head is required on a bar or bolt it is upset a little to thicken the end so that it will not slip right through the bolster; the bar is then heated and dropped as far as it will go through the selected hole, and driven with the hammer. The effect of the hammer is to form a head on the bar from the upset metal.

The *tongs* vary in size and construction according to the nature of the work, and each blacksmith makes them to his own liking. The illustrations show some forms which have been found very handy where the work consists chiefly of repairs to farm tools or implements.

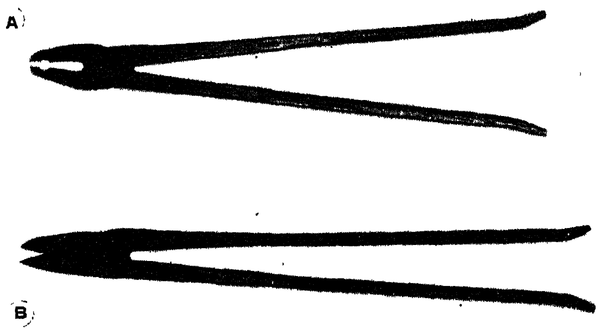


Fig. 6.—A Tongs for holding Links. B General purpose Tongs.

Fig. 6A shows a pair of tongs adapted for holding small links whilst welding. The jaws should only be about $\frac{1}{2}$ inch wide, and have a small groove near the points to enable a firm grip of the link to be obtained.

Fig. 6B shows a pair suitable for general purposes.

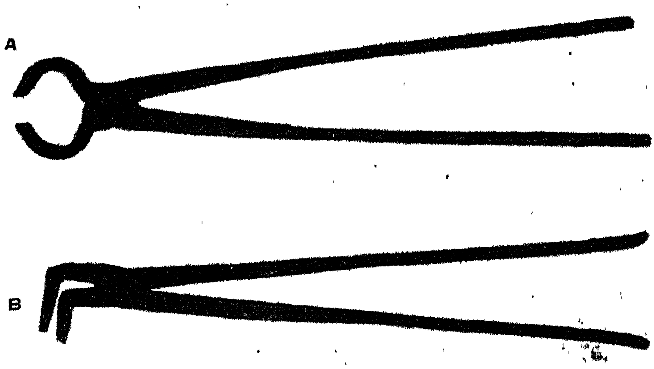


Fig. 7.—A Tongs for holding Bolts. B Tongs for holding Round Stocks.

Fig. 7A illustrates tongs for holding bolts. The rounded jaws leave room for the head, and enable the points to take a firm hold of the bolt.

The tongs in Fig. 7B are designed for holding hoops and flat rings, such as the round stocks of dray wheels, &c. This form gives such a grip that, when hammering, the work can be brought into the required position by merely turning the wrist. This is an important point, as iron cools quickly, and everything must be arranged so that no time whatever is wasted.

Fig. 8A shows a pair of tongs for holding a plough share. The lower two-pointed curved jaw is obtained by making an ordinary flat jaw about 1½ inches longer than the upper one. This jaw is split down the centre, and each section curved as shown, and the tips turned in at right-angles to prevent the share from moving from side to side. Similar tongs, smaller in size, are used for holding coulters.

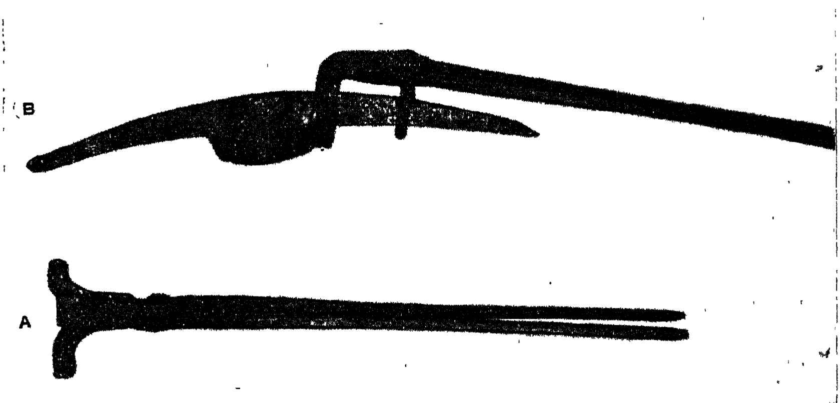


Fig. 8.—A Tongs for holding Plough-shares. B Tongs fsr holding a Pick.

Fig. 8B is an illustration of tongs for holding a pick. The jaws are curved round as shown, and are helped by a ring, an end of which holds the two parts of the tongs together instead of the usual rivet.

Fuel.

The best coal must be selected. Coal which crumbles up when firmly pressed in the hand, and has a bright glassy face on the fractures, as a rule gives the best fire. Hard dull-coloured coal, or bright splintery coal, does not make a good fire. Some of the dull hard coal is very unsuitable. It often contains a good deal of gas, burns away rapidly to white ash, and the fire remains open and does not give a good heat. It does not bind when heated, and instead of forming a close-textured coke, falls to pieces. In a fire of this class a high heat cannot be obtained, and the fire does not last long.

Coal is generally used by smiths for firing, but in some of the bigger shops coke is used. As a matter of fact, it is coke which produces the heat in the small smith's fire also, the only difference being that the coke is produced from the coal by the smith on his own hearth.

Where coal is not obtainable, charcoal is a good substitute. In the pioneering days of the colony, when transportation was difficult, charcoal was much used, but during recent years coal has almost altogether taken its place.

Making the Fire.

The place for the fire is immediately in front of the tue pipe, or in those forges where the tue opening is in the centre, immediately above it. The tue pipe is the pipe which leads the blast to the fire.

The cinders, ashes, &c., of the last fire should be scraped away to leave a depression exposing the mouth of the tue pipe. All the coal, cinders, &c., on the top of the forge must not be removed, as these are required to keep the heat in the fire. The actual space on the hearth occupied by the fire is comparatively small, and the remainder of the surface, with its coal, &c., acts, so to speak, as an insulator.

Shavings, small chips, &c., are placed in the bed of the depression and lighted. When they are well ablaze, coke from the previous fire is put on, and the fire forced with the blast. Green coal, *i.e.*, fresh coal moistened with water, is finally added.

The actual heating material in the fire is coke, which is produced on the hearth by the action of the fire. In its formation from coal the volatile components, such as gases, &c., are driven off, and practically little left but carbon and ash. The special value of coke lies in its difficulty of combustion, which enables it to be brought to a high temperature under blast, and its freedom from blaze and smoke.

In practice, green coal is backed up behind the fire. The heat converts it into coke gradually, and when the fire begins to get low, some of this coke is drawn down. At the same time the coal forces the fire forward and prevents it coming in contact with the tue pipe.

The coke, in addition to acting as fuel, serves as a coat to keep the heat in the centre of the fire. If the fire breaks through this coat, the heat passes out into the air, and it is difficult to secure a good welding heat.

The fire is not ready for use until a good supply of coke has formed. It must be cleaned regularly, as the coke burns away, by throwing out the clinkers, and fresh coke drawn in from the back or sides. The character of the fire has a most important influence upon the nature of the work turned out. It is, in fact, practically impossible to produce good work with a bad fire. This applies particularly to welds.

Effect of Heat upon Iron.

To appreciate the importance of the fire, its effect upon iron and steel must be understood. These metals, when cold, are hard, and cannot be changed in form without in some way injuring their strength. When, however, they are properly heated they can be worked at will without in any way impairing the strength. Heat causes marked changes in the metal. It becomes easily flexible, and if heated still further, plastic, and finally

passes into a molten condition. A homely illustration of the behaviour of iron is seen in the change which takes place in wax when heated. It gradually passes from a hard state into a pliable, then into a plastic, and finally into a molten condition. The changes in iron are not quite the same, but are near enough for illustration.

It is owing to the properties of iron when in the heated condition that it is so valuable. Thick bars can be made thinner, thin bars can be thickened, it can be twisted into all conceivable shapes without impairing its strength, and, finally, separate pieces can be welded into one so firmly that where the joint is made the iron is as strong as in any other part.

When iron is being heated, one point must be borne in mind:—The right heated condition can only be obtained in a fire where there is little or no excess of air. A certain amount of air must be forced into the fire. If insufficient is forced in, heating takes place slowly, whilst on the other hand, if the blast is made too strong, burning takes place rapidly, but still the fire cannot use up all the air. The iron becomes very hot on the surface, while the inner part is still comparatively cool. Now when its temperature becomes very high in the presence of air, *iron burns*. It is probably difficult to realise that practically the same burning that takes place in wood can occur in iron. It is, however, the case, that when iron is highly heated and air is present burning does occur.

This can be proved by placing a piece of iron in a fire and forcing in a heavy blast. In a short time brilliant sparks begin to fly off, and in a little while the iron is all burnt away. When such burning iron is removed from the fire, shooting sparks continue to fly off until it cools.

If the substance composing the sparks is collected and examined after cooling, it will be found very different from iron. It has a dull, slaty or bluish appearance, and is very brittle. It is iron changed into oxide of iron; that is, the iron has combined with oxygen and formed a material which has not the properties of the original metal. This oxide is seen in the scale found on and around the blacksmith's anvil.

The burning of iron is one of the first difficulties with which the amateur has to contend. So long as the fire cannot be so controlled that burning is prevented, good work is almost impossible.

From what has been said it will be seen that burning is due to iron at an intense heat coming in contact with air. The burning, therefore, can be largely prevented by blowing in only just as much air as can be used by the fire. If much over this is blown in, the iron commences to burn. The degrees of burning vary considerably; in the hands of a raw beginner a considerable portion of the iron may be burnt away, and even experienced workmen cannot altogether prevent the formation of some scale. This is objectionable in any class of work; proper welding is interfered with, and in ordinary forging the iron is pitted and roughened.

Fluxes.

As an aid in preventing the formation of scale, *fluxes* are used. Those generally used are sand or borax, either singly or mixed in the proportion of 3 of sand to 1 of borax. The flux should be sprinkled on the iron when it has reached a yellow heat, using sufficient to cover the whole of the surface, especially the parts to be welded. It melts under the heat, flows over the surface of the iron, and forms a protective covering or coat. This covering prevents the air coming in contact with the iron, and burning does not take place, or at least not nearly so easily. Besides this, the molten flux causes any scale which has already formed to melt, and when a weld is being made this fluid scale is forced from between the parts. The objectionable features of scale are its hardness and brittleness, and that when it covers the surface of iron, and an attempt is made to weld, it prevents perfect union.

Welding.

This is often looked upon as a most difficult operation, and one which can only be satisfactorily performed by an experienced smith. Whilst most men are ready to do many of the rougher kinds of forge work, few care to attempt welding. In many cases this is due to failure in attempts made when the underlying principles have not been understood. If the why and wherefore are not known, attempts at welding are gropings in the dark, and the rare successes due merely to chance.

To obtain a good weld, the first requirement is to secure the right heat in both pieces. Where iron is to be welded to iron or mild steel, this is comparatively easy. Other kinds of metal are more difficult to weld and require some skill. If the pieces of iron are of unequal size, care must be taken that the smaller is not overheated. This can be done by starting one before the other, or, if one shows greater heat than the other, by taking the hotter out to cool a little.

When iron and mild steel are heated they gradually change from a hard condition into a softer state. When a certain temperature is reached they become pasty, and if two pieces in a like condition are brought into contact a certain stickiness is noticeable. This is the right welding heat. It is only metals like iron and steel, which become slowly softer before passing into a molten condition, that can be welded. Some cannot be. Lead, as an example, passes suddenly from a hard condition into a molten state without any perceptible intermediate stage.

A further essential to a good weld is that the iron is thoroughly heated right through, and not merely superficially. A comparatively slow fire is required to obtain this. If heating is done too rapidly, only the outer surface is heated, and when the iron is taken from the fire it rapidly cools, so that the time required to form the weld is not available. Perhaps the best rule to follow is to heat slowly and notice when the metal comes into the sticky

condition shown when the two pieces touch each other. If the iron is too cold, welding of course cannot be done, while if the temperature is taken too high, burning will occur and the iron become crumbly.

A clean fire is required. In a dirty fire pieces of clinker, cinder, &c., adhere to the metal and, getting in between the two pieces, cause flaws in the weld. As mentioned before, the fire must also consist of compact burning coke, fed with the right amount of air.

Everything must be in readiness to proceed at once when the iron is sufficiently heated. When it is taken from the fire it cools rapidly, and no time must be lost. The anvil should be clean, and all tools at hand, so that they can be picked up without even looking for them.

Preparation for Welding.

Different forms of welds are used according to he nature of the work. Each differs in some respect, and different methods of preparing for the weld are adopted. The main preparation consists of upsetting and scarfing. The hammering when welding tends to reduce the thickness of the iron at that particular point. To compensate for this the work must be upset, to thicken it at the point of welding, before scarfing. Both pieces of the weld must be upset.

Scarfing.

This is the thinning down, with the hammer, of the tips of the parts to be welded so that they will fit together and weld without much hammering. A more perfect weld is obtained, and less drawing down will be required to finish up the work after welding.

Scarfing is done usually with the pene of the hammer. Generally it can be done by the smith, but to secure exactitude, it is necessary in some cases for the smith to hold the pene in position while the helper strikes with the sledge. It is done whilst the iron is just at a yellow heat, and, before the pieces are returned to the fire for the final welding heat, they should be carefully fitted so that they are in close contact with each other. If this is not done, welding cannot be proceeded with at once, and the lost time results in defective work.

[In next issue Mr. McDonald will finish welding and other elementary principles, and give some practical examples. Keep this *Gazette.*—ED.]

REMEDY FOR PUMPKIN BEETLE (*Aulacophora oliverei*).

MR. D. M. ROSS, of Lismore, tried dusting with ashes and lime mixed, to keep pumpkin beetles from his vines, and reports that it was a great success. In 1908, when the beetles were exceptionally bad, many correspondents stated that ashes and lime would not keep them away. It would appear, therefore, that this simple remedy is effective except when the beetles are exceptionally numerous. In the latter case, the only remedy seems to be to use some arsenical spray or dust, such as Paris green or arsenate of lead.

Protection of Orchards from Injury by Late Frosts.

On the night of the 11th October last year the fruit crops on the New England tableland, between Werris Creek and Glen Innes, were destroyed by a frost of 12 degrees, most of the growers losing everything. This was a serious blow to a good many orchardists, as indications had pointed to a splendid crop.

Some notes have appeared in the press which would, perhaps, lead readers to imagine that, because crops were saved in some elevated districts, the losses incurred in others were due to a want of knowledge or carelessness on the part of growers. This is not the case, as all the higher levels did not suffer to the same extent. Whilst it must be admitted that smudge fires and other artificial means of preventing frosts are efficacious to a certain extent, it is ridiculous to assume that, with a little expenditure on oil or shavings and a little early morning labour, one may defy the worst conditions which may possibly occur.

We give below an account of the practical steps taken at the Glen Innes and Bathurst Experiment Farms to prevent damage to the fruit. At Bathurst the crop was not damaged to any appreciable extent; at Glen Innes the Department lost everything. Readers will be able to see for themselves the conditions under which the methods usually recommended were efficient, and where they failed. The Department hopes to carry out further experiments at both Bathurst and Glen Innes during next spring to obtain more data as to the value of smudges against late frosts; consequently, this can only be regarded as a preliminary report upon the subject.

First of all, the following table, published by the United States Department of Agriculture, shows the temperatures at which the principal orchard fruits are liable to be injured by frost:—

Temperatures injurious to Fruit when in Bud, in Blossom, &c.*

Fruit.	In bud.	In blossom.	In setting fruit.	At other times.
	°F	°F	°F	°F
Almonds	28	30	30	28
Apples	27	29	30	25
Apricots	30	31	31	30
Cherries	29	30	30	29
Peaches	29	30	30	28
Pears	28	29	29	28
Plums	30	31	31	29
Prunes	30	31	31	29

* These temperatures are approximately those of the air in contact with the fruit and blossoms. It is quite possible, however, that very delicate measurements would indicate somewhat lower temperatures, due to evaporation from the immediate surface of the plants.

The principles governing this method of preventing damage are simple enough. Attempts may be made, by lighting fires of various kinds, to maintain the general temperature above the danger point. This, of course, is only practicable within very narrow limits. But to create a dense bank of smoke over the trees is beneficial for two reasons. It checks the radiation of heat from the soil and trees, thus acting as a blanket over the young fruit; and if the fruit has been slightly frozen during the night, the dense "smudge" prevents it from warming too rapidly under the rays of the morning sun. The materials used for the fires are wood and coal, shavings, sawdust, oil, light brush, and rakings from the adjoining bush land. For creating the smoke, straw, stable manure, and rubbish of various kinds are employed, and may be placed upon the fires in a wet condition before the sun rises.

RESULTS OF COLD WIND AND FROST AT THE GLEN INNES EXPERIMENT FARM ORCHARD.

W. LE GAY BRERETON, ORCHARDIST.

The spring last year was early, and at the commencement it came straight on without any "backing and filling." Though rather dry (a rare fault in this district), it seemed to suit the fruit-trees. They blossomed profusely, exceeding all our expectations. The flower buds swelled and steadily opened with no hanging fire half-way. The apples gave every prospect of a 3 to 4 bushel crop after allowing for normal shedding.

On the night of 18th September, the thermometer dropped to 31 degrees F. by midnight. The oil fires were lighted amongst the stone fruits. This temperature only lasted a very short time, rising again to 34 degrees F., due to a very light breeze coming from the east.

While the fires were going, the temperature in the trees about 10 feet away from the fires was raised 6 degrees, and 58 feet away 2 degrees. These readings are only approximate, as the thermometers were very unsteady, the temperature fluctuating from 3 to 4 degrees. The temperature was low for such a very short time that I do not think any harm would have been done, even to the apricots, had no fires been lighted.

Good spring weather continued till the 7th October, when a bitter south-west wind came up, and continued to blow till the 11th. On the latter date very fine flakes of snow fell at intervals during the day.

On the night of the 10th, the wind blew furiously, and the temperature dropped to 29 degrees F. Under these conditions the oil fires fail. In a previous experiment in a heavy wind, the thermometer rose 2 degrees when placed right close to the burning oil; but when shifted a few feet off, and at all above the trail of smoke, it dropped to the normal temperature.

On the morning of the 11th, the apricots were shrivelled. The peaches and plums did not show any damage at first, but late in the day it was evident that they, too, had been ruined.

The apples, at a casual glance, looked sound; but on examination, in many instances, the skin was quite loose on the young fruit. This was most pronounced in Monroe's Favourite and Five Crown, it being difficult to find a sound fruit in these varieties. Stone Pippin, Granny Smith, Buncombe, and Jonathan suffered to a lesser degree. The Cleopatras and pears were apparently quite sound.

Now, the minimum temperature up to this time was only 29 degrees F., and old residents maintain that in many seasons in this district apples have stood as low a temperature without harm. This leads us to believe that the harm done to the apples was not just the drop to 29 degrees F. during the night, but the several days of bitterly cold wind preceding.

Towards the evening of the 11th the wind dropped, and there was every indication of a frost, but as the stone fruit was already gone no fires were lighted. Had we anticipated as heavy a frost as occurred (minimum temperature, 20 degrees F.), we would have shifted the fire-pots to the soundest of the apples. We had only made provision to carry out experiments with oil fires among the stone fruits, and could only have attempted to protect a very small fraction of the apples; but it would have been of interest to see whether the temperature could have been raised sufficiently to do any good. The frost on the night of the 11th took everything that remained of the fruit.

Our conclusions are that the major part of the harm was done to the fruit by the long-continued cold wind, before the severe frost occurred; and that oil fires fail to raise the temperature when a heavy wind is blowing. Late-blooming varieties on this occasion were of no avail, as most of the varieties had finished blooming, and the few that had not were partly out and failed to set.

The following report has been received from Bathurst Farm:—

PROTECTION OF FRUIT CROPS FROM FROSTS, BATHURST EXPERIMENT FARM, 1910.

At this Farm unseasonable frosts are not of sufficiently frequent occurrence to warrant providing an elaborate frost-fighting equipment. Freedom from injury has been aimed at by locating the orchard upon comparatively high land, approximately 200 feet above the level of the Macquarie River. The river is about 1 mile distant from the orchard, and the cold air is drained down gullies upon either side of the orchard, over the undulating country to the river-valley below. It also possesses the advantage of being near the top of the hill.

The orchard is situated at about 2,300 feet above sea level, and the conditions are such as to make the growth of such tender fruits as apricots rather precarious on account of frosts. Apples, pears, plums, and cherries are comparatively certain crops, excepting during seasons of abnormal conditions, such as those under review, which, fortunately, are of rare occurrence.

Generally speaking, upon the uplands of the Farm the last frosts should be over about the first or second week of October, and such are usually light and not calculated to damage fruits. The severity of the cold snap during the past spring may be gauged by the degrees of frost registered by the thermometer on the grass for the following nights :—

October	5,	1 degree of frost.
„	6,	4½ degrees „
„	7,	5 „ „
„	8,	5 „ „
„	9,	4½ „ „
„	10,	0 „ „
„	11,	7 „ „
„	12,	3½ „ „
„	13,	4 „ „

Upon the 9th and 10th sufficient snow fell to remain white upon the ground for a short time, and there were also many cold sleety showers. The condition of the fruit at this time was : Apricots and peaches about as large as a medium-sized walnut ; cherries, about the size of small marbles ; plums and pears had just set ; earliest apples were in full bloom, late-blooming varieties were not in bloom.

Upon the evening of the 11th, it was apparent that the thermometer would fall very low, and arrangements were made to prevent damage to fruit if possible. Owing to there being no permanent frost-fighting equipment, any material coming most readily to hand was utilised. At the back of the orchard and upon the highest land there is a belt of forest from which timber had been cut, leaving a considerable quantity of boughs. A gang of students was sent to collect these and fire them along the western boundary. Others, with the officers, collected old kerosene tins, in each of which was placed 1 gallon of crude petroleum. A piece of old sacking, about 6 inches wide, was placed in each tin as a wick and lighted. Fifty tins were placed along the row of apricot trees, about 35 feet apart. The petroleum burnt for about five hours, and created a dense mass of black, heavy smoke. Fires were started at 11·30 p.m., and kept going until 5·15 a.m. On 12th October the bush fires were again lighted at midnight. Straw was carted and placed at intervals upon wood and coal fires, sixty of which were lighted along the centre of the orchard to protect the apricots and tender fruits. The straw was damped to keep it smouldering. These fires were kept up till 5 a.m.

In all, four cart-loads of straw were used, about 10 cwt. of wood, 5 cwt. of coal, and 50 gallons of petroleum. The cost of material would thus be approximately :—

Waste straw	Nil.
Coal	6s.
Wood	5s.
Petroleum, at 7d....	£1 9s. 2d.

During both nights a thick cloud of smoke was retained over the whole orchard.

No damage whatever resulted, even to the most susceptible fruits. During previous years the apricot crop has been lost under conditions less severe.

It will be seen that different materials were used in the endeavour to maintain the temperature of the two orchards, and to create the desired bank of smoke. Mr. Brereton used crude oil—a material extensively employed for the purpose in various parts of the world; but even if he had had available the boughs and straw used at Bathurst, it would have been useless, if his theory is correct that the fruit was already ruined by the cold wind.

Moreover, it is extremely doubtful whether any steps known to agricultural science or practice could have saved the fruit at Glen Innes orchard on the night of 11th October, even presuming that it had been carried through successfully to that time. In tests conducted by Mr. P. J. O'Gara, of the Bureau of Plant Industry, United States Department of Agriculture, it was found that by using fifty wood fires per acre the temperature could be raised 8 or 9 degrees. As the thermometer at Glen Innes registered 20 degrees Fahrenheit, this ideal result would have only meant 28 degrees or 29 degrees Fahrenheit, at which temperature the fruit would probably have been lost just the same.

With regard to Bathurst, Mr. W. J. Allen, Fruit Expert of the Department, doubts whether much if any damage would have been done were preventives not used, as orchards in which no attempt had been made to save the crop were not damaged, except perhaps on river flats. Apricots in the Orange district carried good crops of fruit this year, notwithstanding the fact that it was bitterly cold there on the dates mentioned, and no smudges were used.

PRIZE LAMBS FROM BLAYNEY AND TRANGIE.

THE Country Freezing Company offered prizes for lambs at the recent Blayney and Trangie shows, and ten carcases from Blayney and fifty-three from Trangie were sent to London and placed on the Smithfield Markets on 23rd November, 1910.

The Agent-General reports that the net weight of the Blayney lambs was 392 lb., or an average of a little over 39 lb; whilst the fifty-three from Trangie only weighed 1,470 lb., an average of about 27½ lb. It is, of course, difficult to judge the feeling of the market from such a small consignment, but Mr. Coghlan, who saw the lambs and ascertained opinions of buyers, has no doubt that the lambs were not fat enough to obtain anything like the highest prices prevailing. The ten from Blayney sold at 3s. 10d. per stone, or 5⅝d. per lb., which must be regarded as highly satisfactory. The Trangie lambs were expected to realise 3s. 6d. or 3s. 8d. per stone. There is a good demand for fat lambs on the English market, and, except when there is a glut, good prices may be depended upon.

Sisal Hemp.

T. H. WELLS, Farnbro', Childers, Queensland.

[Readers interested in the prospects of this industry will recollect that in 1909, at the request of the then Minister for Public Works, Mr. Wells, who has invested a considerable sum in plantation and machinery, wrote a comprehensive paper on the subject, which was published by this Department, as Farmers' Bulletin No. 25. Mr. Wells has now kindly supplied the appended notes to supplement his previous paper.]

THE work at Farnbro' has been carried out for several seasons exactly as described in Farmers' Bulletin No. 25, but this season much more work has been done with the same amount of labour. The average output has been raised to 300 lb. of dry fibre per hour, and the average cost of manufacture reduced to £12 per ton, and this could be further reduced by a larger use of mechanical appliances. The actual cost has, on fine days, when no extraordinary stoppage has occurred, been as low as £9 10s. per ton.

These figures must, however, be taken with caution, as a very great difference is made in the cost by the fibre content of the leaves, and also by the weight of the individual leaves. For instance, a ton of fibre extracted from leaves weighing 2 lb. each, and containing 2½ per cent. of fibre, would cost considerably more than if it were extracted from leaves of the same weight containing 3 per cent. of fibre; and again, 1½ lb. leaves containing 3½ per cent. fibre would give a different result, even supposing all other conditions were equal.

This cost is not the whole cost of production, as to it have to be added the cost of growing (which entirely depends on locality, and may be from almost a nominal cost in a dry district in which there has been no great original cost for clearing, to a very high cost in a wet district where there has been a heavy cost for clearing and weeding); the cost of freights, commission, management, incidentals, and the wear and tear of machinery. Still there is room for a handsome profit between the total cost and a selling price of £25 per ton at port.

Experience has shown that the periodical cutting of the leaves has a marked effect on the fibre content and the life of the plant. At Farnbro' the content was by this method increased nearly 1 per cent.—that is from 2·26 to 3·11. To what extent the life of the plant is increased I cannot say, but I expect it to be two years or more, and it is probable that if the leaves were cut every three or four months the effect would be still better.

After the plants have been set out the greatest care must be taken that they are not smothered with weeds or other growth. This does not necessarily mean laborious chipping with a hoe. Not many weeds do much harm to Sisal, even when it is young, so far as robbing it underground is concerned, but they do immense harm if they crowd it and overtop it at any time; therefore, if the weeds are kept down to about the ground level it is generally

sufficient, and this can be most economically done with a hook. Grasses can be kept down with stock, preferably sheep, when the plants get about a year old. Suckers must be kept down; this is easily done with a hoe of the burr-hoe type.

It canot be too clearly understood that Sisal, like sugar-cane, cannot be profitably grown in small and isolated areas. It must be grown in large areas on cheap land, and it lends itself eminently to the group system of farming, in which a number of small growers combine and either make contracts with the owner of a mill, or raise enough capital amongst them to put up a mill; in other words, on exactly the same principle as sugar-cane is grown in Queensland.

I estimate that twenty families in a suitable locality, growing amongst them 500 to 700 acres of Sisal, and doing all the work themselves, could earn from £150 to £200 per family, besides growing their own vegetables, milk, butter, horse-feed, and fruit. This provides for twenty men and six or seven boys.

It is, of course, possible to carry this principle even further, and for a number of such groups to have their own spinning factory. Four or five of such groups would keep a small factory going. There is a considerable demand for Sisal in Australia, a demand which would certainly increase if the supply were available; and there are also a number of very up-to-date rope and binder-twine factories in the Commonwealth at present drawing the whole of their supply of fibre from abroad.

"Daily Telegraph" Farrer Scholarship.

The Directors of the *Daily Telegraph* Newspaper Company (Limited), offer an annual prize of £10 cash, for competition amongst students of the Wagga and Bathurst Experiment Farms at the end of their first year. The prize is given to the best student who has given special attention to the study of wheat-breeding and wheat-culture, and who proposes to take a second year at one of the Farms, "to assist him in the purchase of such appliances as he may consider desirable to facilitate his further studies." The Department gives the student a second year's tuition at the Farm free of cost, as is done for all students showing good promise.

Written and oral examinations were conducted at Bathurst and Wagga Farms early in December by Mr. Geo. L. Sutton, Wheat Experimentalist. Mr. Sutton has awarded first place to Student K. Wark, of Bathurst Farm, and the Department has recommended this student for the prize. In his report, Mr. Sutton adds that Student A. T. R. Brown, of Wagga Farm, who gained second place, is worthy of special mention, his papers showing that he has given a great amount of study and work to the subject-matter of the examination.

1. Bean plant showing ravages of the fly.
2. Pupa. [Much enlarged.]
3. French Bean Fly. [Much enlarged.]
4. Larva. [Much enlarged.]

French Bean Fly (*Agromyza phaseoli*).

The French Bean Fly.

Agromyza phaseoli, Coquillet.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THIS very serious pest of the French bean was recorded for the first time towards the end of 1898, when several vegetable growers about Erina and Wamberal forwarded specimens of bean plants having the stems badly infested with small dipterous maggots. The eggs had been laid upon the stems just above the surface of the soil. The resultant maggots, feeding just under the skin, caused the tissue to decay, and so weakened the stems that, if the plants did not die back, the first windstorm snapped them off level with the ground. None of the market gardeners had ever noticed this disease among the beans until the time when it first appeared in the fields in the Gosford district in the spring of 1898.

The damaged bean stalks were placed in the breeding jars and kept under observation, until swarms of tiny black flies emerged from the pupæ in the stems of the infested plants a few days later. As this small fly was unknown to the writer, a series of specimens were forwarded to Mr. D. W. Coquillet, the leading authority on diptera at the National Museum of Washington, U.S.A., who, upon examination, found that it was a new and undescribed species of leaf-mining fly. Mr. Coquillet kindly furnished a technical description of the pest, which the writer published in the Proceedings of the Linnean Society of New South Wales (1899, p. 129). A note on the first discovery of the fly will be found on page 560 of the *Agricultural Gazette* of N.S.W., Vol. IX, 1898.

In the September number of the *Gazette* in the following year, this fly was figured, and a general description and account of its ravages given. All over this section of the Gosford district there has been a slight infestation of the bean fields ever since. It is usually first noticed in the spring crops, and becomes much worse in the autumn beans ready for harvest in April and May.

The Range of the Pest.

This last season (1910) it has not only appeared again as a very serious pest, but it has spread over a very much larger area than in former years; probably partly because a very much larger acreage has come under bean crops in the rich scrub lands so admirably adapted for vegetable growing.

The pest is apparently a native species, and it is very remarkable how local it is in its range, which, starting about Kincumber, only extends through the Gosford district around Erina and Wamberal. Though recorded from a

garden at Wamberal in 1898, there are a great number of gardens within a mile to the north which remained uninfested until last year, but at present they are as badly infested as the original area. Now, however, with the opening up of the brush lands, Inspector Brooks informs the writer that it is spreading northwards, and has gained a footing in the gardens round Wyong.

All the market gardeners in the State should watch their bean crops. When the plants begin to show any kind of rusty discoloration of the stems they should be carefully examined, and if the bean fly is at work, the gardener will soon see the destructive maggot moving the damaged skin of the bean stem. The fly may have a very much wider range than we yet know, but which has not been brought under our notice.

From the way it attacks the Wamberal market gardens, it evidently does not travel very rapidly into patches of freshly cultivated land; but once it gets into a bean field it usually appears the following season. In May last we had reports from a number of market gardeners in the Narara and Wamberal districts, stating that the late crops were almost ruined by this pest. I therefore made arrangements with some of the growers, and with Inspector Brooks visited a number of the infested gardens throughout the district.

Everything points to the fact that this is not an introduced pest, but a native of this district, which has abandoned its native food-plant for the more abundant, and probably more succulent, cultivated bean. The only missing link in this fly's life history is its native food-plant. As most insect pests prefer plants belonging to the same order as their natural food-plant, this should be a vetch or leguminous plant, growing wild in the brushes round about the cultivated land; but we have been unable to locate any such plant in sufficient quantities to suggest that it supported this fly before the cultivated bean came into the country.

Description and Life-history.

The following is Coquillet's technical description of this fly:—

Agromyza phaseoli, n. sp.—Black, including the halteres. Front on the sides opaque, the triangle highly polished, almost reaching the lower end of the front. Body strongly tinged with blue, polished, not light coloured pruinose on any of its parts; thorax bearing two pairs dorso-central macrochætæ, destitute of acrostichals Wings hyaline, costa strongly thickened beyond the apex of the first vein, small cross-vein distinctly beyond the middle of the discal cell, hind cross-vein at three-fourths of its length, the small apex of third vein midway between the apices of the second and fourth veins. None of the tibiæ nor of the tarsal joints noticeably dilated or swollen. Length, 1·5 mm.

Like the codling moth and fruit flies, it is in the maggot and pupal stages that the bean fly is known to the gardener, and many growers have not even seen the flies close enough to be sure of their identity. This is not to be wondered at, as it is small and inconspicuous in the bean field, measuring only one-twelfth of an inch in length. It is of a uniform black tint, with dull red eyes, the wings semi-transparent with black nervures, the back (dorsal surface) shining, and the whole insect clothed with fine bristles or

black hairs. Resting on the leaves in the sunshine, it would appear to the gardener to be a short, broad, tiny black fly, very active, and flying away the moment the leaf is touched or moved.

The eggs have not been observed, but the destructive little semi-transparent, slender, white maggot developed from the eggs is of the usual form of this group of flies, the head end tapering to a point and enclosing a pair of black, retractile, horny, hooked jaws, with which it tears the tissue. It works its way through the tissue while feeding. The anal extremity is the thickest, and truncate or cut off sharply at the tip, ornamented with two little rosettes. The maggot is somewhat of the same general appearance as a small fruit-fly maggot.

When full grown, this maggot forms a pupal covering, and, under the protection of the hard, stiff, chitonous skin, is attached to the bean stem in a crevice of the damaged skin, or is completely covered with it. Exposed to view, it is a dull yellow, elongate, oval little pupa, with both the extremities dark brown, and furnished with a pair of short horn-like projections, those upon the narrower head end being short and curved, but the anal ones smaller and more slender.

The Damage.

The Wamberal market gardeners say that French beans are one of the most profitable crops that they can grow in the rich soil of their district, and estimate their loss during the two months of April and May at several hundred pounds, even at the very low rate of a shilling per bushel; but 2s. or 3s. are often the ruling rates for good beans.

When investigating the first outbreak of this pest, it was noticed that the point of attack was from the surface of the soil to about 2 or 3 inches up the main stem of the bean plant, the eggs being deposited in the cracks or beneath the epidermis in the tissue of the plant. The eggs produced semi-transparent slender maggots, which fed upon and destroyed the surface tissue, and when full grown pupated in or under the rusty, damaged, scurfy skin of the bean plant. This year several growers called my attention to the fact that, besides depositing their eggs in the stem of the bean, when numerous the flies attack and damage the leaf stalks, puncturing the upper surface of the leaf at its junction with the stalk, and sometimes the maggot tunnels down the leaf stalk. They confirmed the statement that the spring crops are seldom if ever damaged by its presence to any appreciable extent; but as the warm weather comes, the flies gradually breed up and develop in such swarms as to culminate as a destructive pest in the fall of the year, when climatic conditions are favourable, or their parasitic enemies are not sufficient to keep them in check. The exposed maggot and pupæ, close to the outer surface of the stem, are very easy prey to many hymenopterous parasites.

Though the primary damage to the bean plant is caused by the splitting and corroding in consequence of the presence of the maggots, the plant will often continue to bear beans for a long time afterwards, but the breaking off of the damaged stems thus injured soon reduces the value of the crop.

Remedies.

The growers find that in good growing weather they can gain some advantage over the flies by hilling up the soil round the plants, so that the stems are covered, when the bean plant will put out a fresh supply of fibrous roots above the damaged tissue. The hilling up of the bean rows also protects the stems if done before the flies first appear. No spray or wash that has been used seems to have any effect upon the flies; and as the maggots do not feed upon the surface of the plant but under shelter of the tissue, no poisonous spray upon the foliage would injure them. Tar-water might be found effective to keep the flies from depositing their eggs, but it would have to be sprayed very carefully all over the stems and foliage, as the egg-laying instinct of the gravid female would soon find out any untainted foliage.

As with many other pests, it is a case for clean cultivation. The maggots pupate in the bean stems, from which, if the plants are allowed to remain in the field, the flies will emerge in due course. It would be advisable to pull and burn all infested bean plants as soon as the last lot of beans have been gathered; otherwise, if the plants remain dead and dry, many pupæ may drop out of the cavities in the stems, and, falling on the earth, remain in the ground long after the dry stalks have been removed. Several growers informed me that, although they had cleaned up and burnt all the old beans the previous season, they found the following year, when they planted beans in the same land, that they had not got rid of the flies. Probably some pupæ had dropped from the damaged bean plants before they were removed.

Samples of Fruit from Paterson District.

At the end of November, Mr. Fruit-Inspector L. J. Smith forwarded samples of fruit grown by Messrs. J. Gardner, of Paterson, and W. Borham, of Big Creek, Hill Dale. Mr. Allen, Fruit Expert, states that the oranges were of good size and fine flavour, clean fruit, and in particularly good condition for that time of the year. If well graded and packed, they would be worth about 12s. per case on Sydney market. The lemons were a little on the large size, but were particularly fine-skinned, smooth fruit. The plums resembled Wright's Early, and should be valuable on account of being ready for market so early.

Samples of oranges grown by Mr. J. Hoffman, of Trevallyn, also forwarded by Mr. Smith, were amongst the finest which have been submitted this season, and a credit to any district. The flavour was all that could be desired, and they were large, clean, firm fruit, which would find ready sale at highest market value.

Sheep-Maggot Flies.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

IN response to the request for specimens of blown wool containing fly maggots taken from infested sheep, which was published in the newspapers and in the *Agricultural Gazette* some months ago, thirteen packages were received at the Entomological Branch of the Department of Agriculture from all parts of New South Wales, showing that this pest is spread all over the State.

These samples of maggoty wool were placed in suitable material contained in glass breeding jars in the insectarium, where they were under close observation until the flies bred out. The flies were carefully examined, identified, and placed in the entomological cabinets.

These systematic observations show that it is the two common house blowflies, *Calliphora villosa* and *Calliphora oceaniæ*, that are responsible for the greater part of the blown wood, as will be shown in the following summary; but there is a third species, one of the metallic-blue flies, that also blows wool, as stated by some of the sheepowners who have studied the question.

Thus we now know that there are three distinct species of flies that cause blown wool. All three, however, belong to the genus *Calliphora*, in which all our common blow-flies are included; and though the "Green Bottle-fly" (*Lucilia sericata*), the fly that does all the damage in Great Britain, is a very common fly in Australia, and one of the first to blow meat exposed for experiment in the back yard or garden, it has never been bred from maggots in wool during a very large series of experiments carried out all through the summer months this last year.

The third species, now identified for the first time, is *Calliphora rufifacies*, a bright metallic-blue fly, much smaller than either of the two yellow blow-flies. This is the species that produces the "hairy maggots" known to the sheepowner. The maggots are quite different from the smooth, cylindrical ones of both the yellow blow-flies and *Lucilia sericata*, as each segment of the maggot is furnished with a band of slender, fleshy tubercles (the so-called "hairs" of the sheep-men). They are also much shorter, and broader in the centre. The pupal forms often found in the wool or in the remains of a dead sheep (and not buried in the soil beneath), are also fringed with the dried remains of these tubercles, and thus differ from the smooth oval cocoon of the other blow-fly pupæ.

It has been lately reported that sheep-maggot fly has attacked the sheep introduced into the New Hebrides, but no specimens have yet been obtained. The writer took a number of species of metallic blow-flies (among others, *Lucilia tasmaniensis*) when collecting in the Solomon Islands (1909). This is a large, handsome, deep-blue fly, originally described from Tasmania, but also found in Queensland, which may be the culprit.

The following is a list of the specimens of blown wool sent into the Department, with a record of the flies bred from each consignment:—

August 12.—Mr. A. J. Studdy, Geogong, Queanbeyan.—On the 8th September, a large number of the common yellow blow-flies (*Calliphora villosa*) emerged from the soil in the jar, but no other species were obtained.

August 14.—Mr. J. F. Edwards, Lansdown, Canley Vale.—On the 3rd September, about a dozen specimens of the same fly (*Calliphora villosa*) were bred out from the wool sent down.

August 17.—Mr. J. T. Farrell, Loyola, Coonamble.—On the 10th September numbers of the metallic blue blow-flies (*Calliphora rufifacies*) emerged, and on the 13th a number of specimens of *C. villosa* came forth from this wool. This sample consisted of very badly-infested, evil-smelling wool, full of maggots in all stages of development.

August 20.—Mr. M. McLean, Boona West, Condobolin, sent a large sample of badly-infested wool, from which on the 12th September, 1,050 specimens of the common blow-fly (*Calliphora villosa*) had emerged in the jar. As one female has been observed to lay 182 eggs in one batch, and as the time from the laying of the eggs to the emergence of the perfect flies is from fourteen to sixteen days, it can be easily understood how rapidly these pests can increase.

August 26.—Mr. E. Cory, Wonga, Gurly Siding, sent infested wool, from which 104 specimens of the smaller yellow blow-fly (*Calliphora oceaniæ*) emerged on the 17th September.

September 1.—Mr. L. S. Edwards, Mundarra West, Wagga, sent specimens from which a number of the large yellow blow-flies (*Calliphora villosa*) bred out ten days later.

October 14 —Mr. H. R. Balfour, Wooringan, Culcairn, sent down blown wool, from which 60 specimens of the same species as in the last sample were bred out on November 5th.

October 10.—Mr. J. H. Parsons, Lincoln, Armidale, sent infested wool from which 50 specimens of the smaller yellow blow-fly (*Calliphora oceaniæ*) bred out on the 10th November.

Early in November Mr. H. J. Dore, Buckaginga Estate, Henty, sent blown wool, from which a few specimens of *Calliphora villosa* bred out on the 16th November, and on the 23rd November a number of *Calliphora oceaniæ* emerged.

November 17.—Mr. G. W. Hodgson, Martingale, Walgett, sent down a quantity of blown wool infested with "hairy maggots," from which on the 24th November, a large number of the metallic-blue blow-flies (*Calliphora rufifacies*) emerged.

Two samples of wool, one from Mr. H. W. Thompson, Napperley, Gunnedah, and the second from Mr. G. S. Morton, Dulwich, Casewell, were thickly infested with "hairy maggots," and produced large numbers of the metallic-blue blow-flies (*Calliphora rufifacies*) about the same date.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Alumny and Carr's Creek ...	Mr. A. R. Wetherspoon, Alumny Creek, Grafton.
Bathurst	Mr. S. McKibbin, O'Connell.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown...	Mr. S. A. Levick, Roseneath, Cundletown.
Inverell	Mr. W. A. Koak, Rock Mount, Inverell.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
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Wagga	Mr. J. Halloran, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.

The readers of the *Agricultural Gazette* are invited to join their local branch. The Department will be glad to hear from persons who would be willing to form branches in other districts.

Bathurst.

A branch has been formed at Bathurst, with Mr. W. H. Webb as chairman; Mr. G. Trevitt, of Peel, as vice-chairman; Mr. E. Armstrong, of Raglan, as hon. treasurer; and Mr. S. McKibbin, of O'Connell, as hon. secretary. The meetings will be held in the office of the Bathurst Agricultural and Pastoral Association, and the subscription has been fixed at 4s. per annum.

Casino.

8th November, 1910.—Mr. G. Marks, Inspector of Agriculture, gave a lantern lecture to the members on "Fodder Crops and Ensilage."

5th December, 1910.—The Dairy Expert of the Department, Mr. M. A. O'Callaghan, lectured on "The causes of cream taints and decomposition."

Cundletown.

We regret that Mr. C. D. Eedy, the late hon. secretary of this branch, has left the district. Mr. S. A. Levick has kindly consented to occupy the vacant position.

Mr. Dairy Instructor Hampshire will lecture, on a date to be fixed in February, on "The handling and treatment of cream for butter-making, and the causes of inferior cream."

Walli.

Arrangements were made for Mr. Inspector Reynolds to lecture, on 25th January, on "Wheat-growing and the cultivation of the soil"; and, in February, Mr. Sutton, the Wheat Experimentalist, will follow with a lecture on "The treatment of seed wheat to prevent smut."

Lectures on Sheep and Wool.

Lectures and demonstrations by Mr. J. Wrenford Mathews, the Sheep and Wool Expert, will be delivered to the members of the branches at Trundle on February 1; Peak Hill, February 3; Stockinbingal, February 9; Bathurst, February 17; and Wagga, February 22. These will be the first of a course which will embrace the questions of sheep and wool as applied to mixed farming. The following subjects will be discussed:—The characteristics of breeds relative to their wool and mutton-producing qualities; suitable breeds for given localities; the rearing of early lambs for export; wool considered from its commercial standpoint; wool-classing, including the handling of small and larger clips.

Lectures on Veterinary Science.

Arrangements are now being made for lectures and demonstrations upon veterinary subjects, to be selected by the branches, to be delivered during the month of February at Bathurst, Carr's Creek, Casino, Inverell, Little Plain, Wagga, and Walla Walla.

Functions of Experiment Farms.

"Modern scientific agriculture calls for as high an order of intelligence as any other science. Now the farmers on the farm have not got the time, the opportunity, nor the knowledge to make the experiments. Let your agricultural colleges make the experiments. Let them analyse your soils; let them know what they need most; what they have lost by years of cultivation; let them adapt the seed to the soil; let them know what is the best season and the best time to plant the different seeds, and when and how to divide them, so that the farmer will have crops ripening, not all at once, but one following the other, so as to give him an opportunity to take care of his crops and take care of his property. That is the work of your agricultural college and your experiment farm; and let me say, if you are to have experiment farms—and you have some of them in Montana, and they are doing excellent work—let me advise you to be very, very careful into whose hands you commit them. If a man is not willing to sit up day and night, he is not fit to be in charge of an agricultural college or experiment farm, because through his laziness and through his indifference, through his ignorance, or from some other reason, he may lower the standard of what can be done; and, of course, *if he cannot do better than the average farmer could do*, you had better close him up."—James J. Hill, at Fourth Dry Farming Congress, Billings, Montana, U.S.A., October, 1909.

Varieties of Wheat Recommended by the Department of Agriculture.

FOLLOWING the precedent established last year, a Conference of Departmental officers was held in Sydney on 17th and 18th January, 1911, for the purpose of discussing matters connected with wheat-growing. One of the objects of the Conference was the revision of the list of varieties of wheat recommended by the Department for cultivation.

There were present: Messrs. H. C. L. Anderson, Under Secretary, Department of Agriculture; G. Valder, Chief Inspector; G. M. McKeown, Manager of Wagga Experiment Farm; R. W. Peacock, Manager of Bathurst Experiment Farm; R. H. Gennys, Manager of Glen Innes Experiment Farm; F. G. Chomley, Manager of Yanco Experiment Farm; G. L. Sutton, Manager Cowra and Coolabah Experiment Farms, and Wheat Experimentalist; M. H. Reynolds, H. Ross, and A. H. E. McDonald, Inspectors of Agriculture.

It was resolved that the wheat districts of the State be grouped together in the following divisions:—

1. Very dry and hot.—(Of which the Nyngan Farm is typical.)
2. Dry and hot.—(Of which the Wagga Farm is typical.)
3. Medium dry and hot.—(Of which the Cowra Farm is typical.)
4. Cool.—(Of which the Bathurst Farm is typical.)
5. Cold and moist.—(Of which the Glen Innes Farm is typical.)
6. Coastal.—(Embracing those districts bordering on the coast, and which are specially subject to rust.)

It was further decided that the following varieties of wheat should be recommended for cultivation during the year 1911:—

Variety.	Period of Planting.	Districts.
Bobs	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot; cool (on poor soils).
Bunyip	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot.
Cleveland	Early and mid-season ...	Cool; cold and moist.
Comeback	Mid-season and late	Dry and hot; medium dry and hot; cool.
Federation... ...	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot; cool.
Haynes' Blue-stem.	Early and mid-season ...	Cold and moist.
Jonathan	Early and mid-season ...	Cool; cold and moist.
Marshall's No. 3 ..	Early and mid-season ...	Dry and hot; medium dry and hot.
Rymer	Early and mid-season ...	Dry and hot; medium dry and hot.
Thew	Early, mid-season, and late...	Coastal.
Warren	Mid-season and late	Coastal.
Yandilla King	Early and mid-season ...	Very dry and hot; dry and hot; medium dry and hot.
Zealand	Early and mid-season ..	Dry and hot; medium dry and hot.

All of the above, with the exception of Federation, are dual-purpose wheats, and are recommended as suitable for cultivation for either grain or hay in the districts named. Federation is recommended for grain alone.

In addition, the following varieties are recommended for cultivation for *hay or greenstuff*, but not for grain:—

HAY WHEATS.

Variety.	Period of Planting.	Districts.
Firbank	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot.
Huguenot	Early, mid-season, and late...	Coastal.
John Brown ...	Early, mid-season, and late...	Coastal; cool.
,, (for greenstuff)	Early	Very dry and hot.
Medeah (for greenstuff)	Early and mid-season ...	Coastal; cold and moist.
Steinwedel... ...	Early and mid-season ...	Very dry and hot.

The following varieties were selected as being suitable for continued experiments with wheats and manures at the Experiment Farms and in the Farmers' Experiment Plots:—

Variety.	Period of Planting.	Districts.
Bayah	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot.
Cedar	Early, mid-season, and late ...	Cold and moist.
Florence	Mid-season and late	Very dry and hot; dry and hot; medium dry and hot.
Genoa	Early and mid-season ..	Cool; cold and moist.
	Early	Medium dry and hot.

The characteristics and pedigrees of the wheats named are all described in Farmers' Bulletin, No. 41, copies of which may be obtained free by farmers interested on application to the Under Secretary, Department of Agriculture, Sydney. It will be observed that the varieties Jumbuck, Uppercut, and Nutcut have been removed from the list, and are not now recommended; whilst of those considered suitable for trial only last year, Warren and Yandilla King are now definitely recommended for cultivation as dual-purpose wheats, and Huguenot for hay, each in suitable districts.

FARRER MEMORIAL FUND.

THE Committee desire to acknowledge receipt of a sum of £5 5s. from Messrs. Crago Brothers, Federal Flour Mills, Newtown and Bathurst.

" Take-all."

Practical Methods for its Eradication and Control.

GEO. L. SUTTON, Wheat Experimentalist.

This disease is found to some extent in all our wheat districts, though it has not assumed the same proportions as in some of the other States. Yet it is increasing, and has now become sufficiently widespread to require very serious consideration by our farmers. It demands attention by each individual wheat-farmer in this State.

"Take-all" can be recognised by portions of the crop becoming blighted or withered, the green plants turning greyish-white, and in some cases being entirely destroyed. A distinguishing feature of the disease is that it occurs *in patches.* These patches are irregular in shape and vary in size. On making an examination of the diseased plants, it will invariably be found that the base of the stem has a brown or black discoloration

During the past season it was quite evident that this disease is on the increase. In some paddocks quite half the crop was affected. The disease will continue to increase and spread, unless measures are taken to at least control and check it. It may be that periodically its progress will be checked by some seasonal peculiarity. For instance, next year it *may* be less common than during the past season. If this be so, it is likely to delude some into the belief that our climate will keep the disease in check. There is nothing to warrant such a delusion, which can only mean loss to the State as the result of greatly diminished yields. It may spell ruin to individual farmers who allow themselves to be so deluded.

"Take-all" is found most frequently on old continuously worked land, but it also appears on old fallowed land, and on new land, fallowed and unfallowed. Because of this, some may be inclined to believe that nothing but seasonal peculiarities can keep the disease in check, and in consequence may not trouble about adopting methods to prevent and control it. No opinion could be less sound.

Careful and thorough methods will effectually stamp out the disease from our wheat paddocks.

It is now recognised that "Take-all" is a fungus disease which is reproduced from year to year by means of spores left in the ground from the previous crop. Whilst there are any spores in the soil, the disease is likely to appear in the wheat crops growing in that soil. It is, therefore, evident that the only certain way to prevent this disease is to have the soil free from such spores.

The only practical method of doing this, and thus eradicating the disease, is to allow, and, if possible, assist the spores already in the soil to germinate,

but to prevent the fungus from maturing and thus reproducing fresh spores. This can be done by killing the fungus by starvation. As the fungus cannot obtain its food directly from the soil, but must obtain it by living upon wheat or certain other plants, it can be starved and killed by preventing such plants from growing in the soil.

The farmer can kill the fungus and eradicate the disease by preventing wheat, and the other plants referred to, from growing upon the soil whilst the "Take all" spores are in it. This implies, in the first place, a change, for a period, from wheat-growing; and, in the second place, fallowing in such a way that the fallows are kept so clean that they provide no plants upon which the "Take-all" fungus can live and mature. Instead of fallowing, the same result may be obtained by growing, during the period of eradication, only those crops which it is known the "Take-all" fungus cannot live upon.

The treatment to be thorough will require to be continued long enough to afford *all* the spores an opportunity of germinating. One year may not be long enough for this to take place. It is, therefore, advisable to allow the treatment to extend over at least two years. For this reason, a combination of the alternative methods of combating the disease will generally be found the most suitable for wheat-growers.

It is now known that the "Take-all" fungus cannot live upon the oat plant, either in its wild or cultivated form; nor has it been found upon rape. These plants can therefore be grown during the period when the farmer is ridding his land of the spores. To prevent a recurrence of the disease, it is advisable that they, or other crops equally resistant to the disease, be grown in rotation with the future wheat crops.

It is now also known that the "Take-all" fungus, in addition to living upon the wheat plant, can live upon barley, barley-grass, and spear-grass; and it is probable that there are other of our cultivated plants and grasses upon which it can live. It is useless to cease growing wheat in order to eradicate "Take-all" unless the other plants upon which it can live are also prevented from growing, either on the fallows or among the resistant crops which are being grown in lieu of wheat. For the treatment to be efficient, the fallows and change crops must, therefore, be kept thoroughly clean from those plants and weeds upon which the fungus can live.

Any method which destroys the spores, partially or totally, will assist in controlling the disease. Heat destroys them; therefore burning the stubble, especially if it be a good burn, destroys numbers of spores and lessens the pest. It is, however, too much to expect that the fire from burning stubble will reach the spores that may be on the part of the stem underground, or on the roots. Burning the stubble will, therefore, help to lessen the spread of the disease, but is unlikely to eradicate it.

As the disease is caused by spores which are in the soil, treating the seed with fungicides will be ineffective. In this respect "Take-all" differs from "bunt" (smut), as the latter is caused by the spores which adhere to the seed, and which can, therefore, be destroyed by treating the seed with suitable fungicides.

The spores in the soil could be destroyed by a fungicide, such as a solution of bluestone, if it were possible to reach them. Such, however, is impossible. In rare instances, such a method has proved effective for small patches, but as a practical method of treating the disease it is unsuitable.

Because "Take-all" is reproduced by several of our grasses, it cannot be eradicated or even checked by utilising the cultivated land as pasture land for a period. Some of the grasses composing the pasture are likely to keep reproducing the disease. Thus, when the land is again cultivated, the disease is likely to be as bad as, if not worse than, it was before.

For farmers who *must* continue to grow wheat on land affected with "Take-all," the best course to adopt is to burn the stubble, and plough as soon as possible after harvest, and to plant as late as is safe with an early-maturing variety like Bunyip. During the period between ploughing and planting, the land should be thoroughly cultivated, to destroy weeds and provide suitable conditions for the "Take-all" spores to germinate before the wheat is planted.

The spread of "Take-all" can only be regarded as a national disaster, and growers who have it in their paddocks are deserving of sympathy. But from a national rather than from an individual standpoint, it is possible to see a bright side to this matter. The heavy cloud of "Take-all" which is now threatening may have a silver lining. *The disease can be eradicated.* The measures necessary for its eradication are such as tend to profitably produce better crops. The prevalence of the disease may *compel* us to adopt better methods, with their consequent increased yields. It is not unlikely that what now appears to be a calamity may in the future prove to be the reverse.

Summary.

"Take-all" is spreading, and demands the attention of each wheat-grower in this State.

It will increase unless measures are taken to check it.

Our climate will not control it.

Careful and thorough methods will effectually stamp out the disease from our wheat paddocks.

"Take-all" is a fungus disease.

The practical way to eradicate the disease is to starve it by discontinuing wheat-growing for a period, supplemented by—

(1) Clean fallows; or,
(2) Change crops.

Suitable change crops are oats and rape.

Unsuitable ones are barley, barley-grass, and spear-grass.

Burning the stubble helps to check its spread, but is unlikely to eradicate the disease.

Ineffective methods of checking the disease are—

(1) Treating the seed.
(2) Spraying the soil with fungicides.
(3) Turning the cultivated land out to pasture.

Field Experiments with Wheat.

TILLAGE EXPERIMENTS WITH THE PLOUGH.

GEO. L. SUTTON, Wheat Experimentalist.

THE object of these experiments is to determine the comparative effects upon the resulting crop, and also upon the texture and fertility of the soil :—

(1) Of the continued use of the disc and of the mould-board ploughs ;

(2) Of ploughing at different depths with the above ploughs—

- (*a*) At 8 inches deep to represent deep ploughing ;
- (*b*) At 6 inches deep to represent medium ploughing ;
- (*c*) At 4 inches deep to represent shallow ploughing.

(3) Of subsoiling the deep ploughing 2 inches to 3 inches below the plough depth.

(4) Of the application of superphosphate to the various depths of ploughing.

From a farmer's standpoint, the objects are to determine what plough to use and how deep to plough.

In 1910, section 4 was discontinued, as it tended to complicate the experiment, and the results already obtained indicated that such complication was serving no good purpose.

These experiments are in continuation of those commenced at Cowra Experiment Farm in 1905, and described by the late Wm. Farrer and the writer in the *Agricultural Gazette* for April, 1906. As originally planned, they were continued at Cowra in 1906. In the following year a slight

modification was made in the arrangement of the plots to admit of a system of check plots being introduced. It was considered that such a system would enable more reliable comparisons to be made by minimising variations due to inequalities of the soil. The re-arrangement was made so as to alter the original plan as little as possible.

Plan A shows the original method of arranging the plots and also the modifications made in 1907. From this it will be seen how slightly the original plan was altered.

Arrangements were also made to commence the planting of the experiment at Coolabah Experiment Farm during the same year.

The general conditions governing the experiments at both farms were as follows :—

Rotation.

The experiment was planted at each place in accordance with the rotation deemed most suitable for the particular district. At Cowra a two and at Coolabah a three course rotation was adopted.

Treatment prior to planting Wheat.

Prior to the ploughing of the respective plots, the treatment given to the whole of them was such as would tend to make the area which comprised them uniform and even.

Fertilizer.

During the course of the rotation each plot received the same amount and kind of fertilizer. Such fertilizer was applied with the fodder crop to those plots which had not had it applied with the wheat crop—that is, one of the two plots ploughed at any given depth received an application of fertilizer when the wheat was planted; the other received the same kind and amount of fertilizer when the fodder crop was sown. Both the plots were, therefore, fertilized, though at different periods. The plot which, in the accompanying tables, is referred to as being fertilized, is the one to which the fertilizer was applied when the wheat was sown. In this case the fertilizer was applied *directly* with the wheat.

Fodder Crop.

All the plots were planted with the same variety of fodder crop, sown at the same rate and on the same day, or on two successive days. The fodder crop was fed off over the whole of the area comprising the plots in any one course of the experiment, thus tending to distribute the residues and manures evenly.

Ploughing.

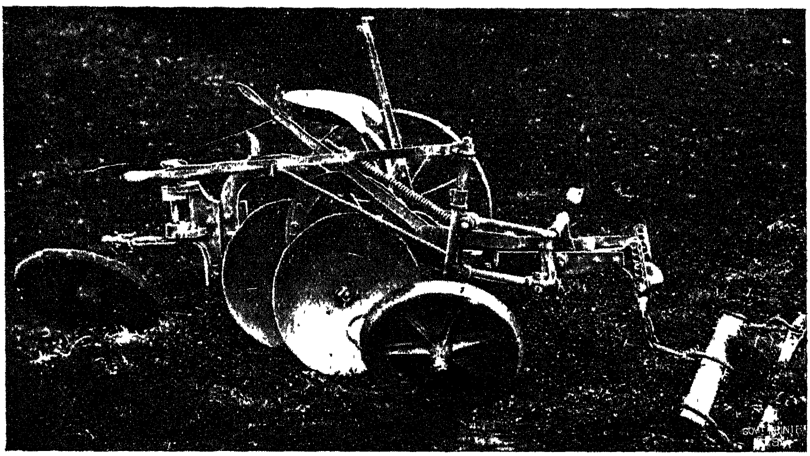
The ploughing of all the plots was done at approximately the same time, and at such times as were most advantageous for the farm practice. The ploughing was always done in accordance with the plan set out for the respective Farms, and to the depths specified. Necessary arrangements were made to ensure that the ridges and "clean-out" furrows were located at the

boundaries of the plots. Precautions were also taken to make sure that the different plots were ploughed to the specific depths necessary for the require ments of the experiment.

Cultivation.

After the fallow ploughing for wheat, the treatment of the soil was uniform for all the plots. The cultivation of the fallow was invariably commenced shortly after harvest, and had for its object the destruction of weeds and the maintenance, until planting time, of a dry soil mulch 2 to 3 inches deep.

Prior to 1908 the cultivation was done with the spring tooth cultivator and harrow; since then the one-way disc cultivator has almost entirely taken the place of the former implement.



Disc plough used 1905-8.

Planting the Wheat Crop.

The planting at both Coolabah and Cowra has been done with a drill, and, as far as possible, the whole of the plots in any one course of the experiment have been planted on the same day. When this has not been quite possible, the planting has been completed as early as possible on the following day. At the respective Farms the whole of the plots in any one year have been sown with the same variety of wheat, drilled at the same rate, and at the same depth.

After Planting.

At Coolabah, the soil, after planting, was compressed about the seed by a roller, to the back of which was attached a light harrow. The function of the harrow was to loosen the compacted surface made by the roller.

At Cowra, the treatment immediately after planting consisted in merely harrowing the soil, mainly to ensure the seed being covered. During its growth the crop was harrowed whenever sufficient rain fell to form a crust on the soil. This practice was continued until the crop shaded the ground.

Harvesting.

The portion harvested for comparative purposes was taken from the centre of each plot. The ends and other portions likely to cause variation as the result of influences outside the plot were cut off and discarded.

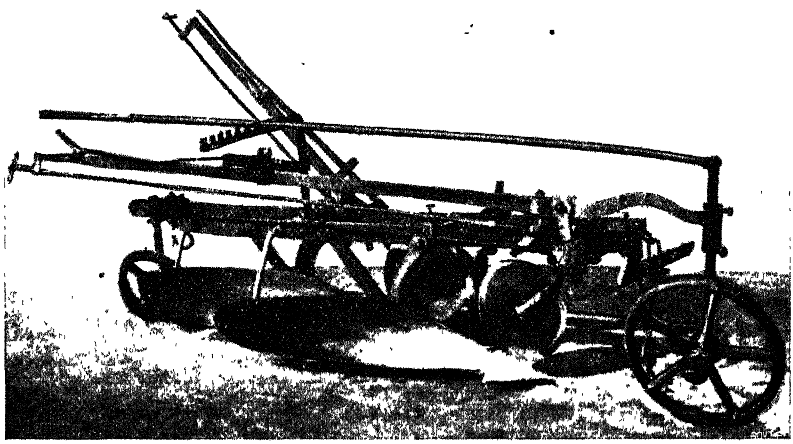
Results.

The details and results of the experiments at the respective Farms are supplied by the officers in charge of the experiments at them.

"Natural" and "Percentage" Yields.

In the tables which follow, columns are devoted to what are called the "natural" and "percentage" yields. The actual yield of any plot is reduced to these terms to render comparisons easy and as reliable as possible.

To reduce the risk of error when making comparisons, a system of "check" or "standard" plots has been introduced. These "check" plots have been placed at frequent intervals to eliminate as far as possible differences due solely to variations in the soil.



Mould-board plough used 1905-8.

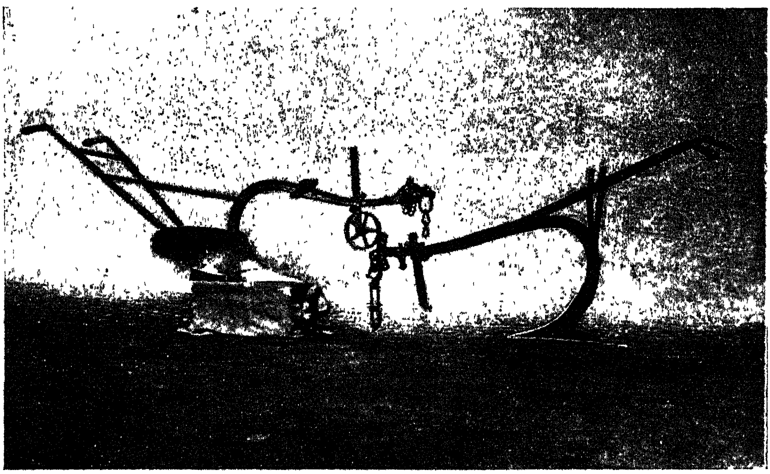
The function of the "check" plots is to act as a "rule" or "measure," by which the value of the yields from the other plots can be gauged. In order to make comparisons by the use of such a measure, it is necessary to estimate what the yield of the plot to be compared would have been had it been planted as, and under the uniform conditions of, a "check" plot. This estimated yield is called its "natural" yield. Its estimation is based upon the assumption that the differences between neighbouring "check" plots is due to regular and gradual variations in the soil between them. It is reasonable and logical to make this assumption. All the "check" plots are treated, as far as possible, in exactly the same way; it is, therefore, reasonable to believe that any difference between neighbouring ones is due to variation in the soil. Because such plots are not widely separated, it may also be assumed that any variation would be regular and gradual.

The "natural" yield of any plot will, therefore, be intermediate between that of its two "check" plots, and proportionate to its distance from them.

The "actual" yield of any "check" plot is also its "natural" yield.

Comparing Results.

As the "natural" yield of any plot is the measure by which the relative value of its actual yield is determined, comparisons between plots have not been made by comparing their "actual" yields one with another; but by comparing the proportion which the "actual" yield of one plot bears to its "natural" yield with the same proportion of any other plot. To render comparisons easy, this proportion has been reduced to a common basis, and is called the "percentage" yield.



Single-furrow plough used 1909. King Subsoiler used 1907-10.

The "percentage" yield of any plot is the proportion which its "actual" yield bears to its "natural" yield, the latter being represented by 100. The "percentage" yield of any check plot is, therefore, 100.

By having the actual results reduced to this common basis of "percentage" yields, comparison between plots situated at remote distances from each other, or even planted in different years, may be readily made.

TILLAGE EXPERIMENTS WITH THE PLOUGH, COWRA EXPERIMENT FARM.

F. DITZELL, Experimentalist.

These experiments occupied two sets of blocks—C and D IV to VI, and F and G IV to VI—which were planted in accordance with a rotation in which wheat was grown alternately with a fodder crop. In 1905 and 1906 the

wheat was planted on newly-prepared virgin soil which had not been fallowed. In later years it was planted after a fodder crop, and was preceded by a summer fallow. During the progress of the experiment, the fodder crops grown were :—

1906, black tares.
1907, black tares.
1908, rape.
1909, black tares.
1910. barley.

The land was prepared for the fodder crops by ploughing it as soon as possible after the wheat harvest was finished. The fodder crops were fed off as available by sheep, the manure and residues being ploughed in in the late spring or early summer. The various ploughings and plantings were always done in accordance with the details as set out on plan A.

Ploughs Used.

For Plots requiring the Disc Plough.—From 1905 to 1908, the Secretary Double-furrow Disc Plough was used. In 1909 and 1910 a four-furrow disc plough has been used.

For Plots requiring the Mould-board Plough.—From 1905 to 1908 these plots were ploughed with the Hornsby Double-furrow DD3 Plough; in 1909, with a single-furrow Bluebeard Plough; and in 1910, a four-furrow Clyde-Whitlock.

For Subsoiling.—The disc-ploughed plots were subsoiled every second furrow by a subsoiling attachment of the double-furrow plough. On the mould-board plots to 1908, the subsoiling was done by a King Subsoiler, worked in every second furrow, and following the double-furrow Hornsby plough. Since 1908, the subsoiling has been done by means of the King Subsoiler following the Bluebeard plough.

Planting.

In 1905–6, the variety sown in this experiment was Bobs. Since then the variety sown has been Comeback. The rate of seeding has been uniform in any one year, and has varied from 36 to 42 lb. per acre.

Harvesting.

In 1907, windstorms so mixed the stooks on some of the plots that the results were valueless for comparison. In 1909, the whole of the crop, which was in stooks on the respective plots ready for threshing, was destroyed by a bush-fire which swept across the Farm. In 1905, 1906, and 1910, the plots were harvested with the stripper; in 1907, 1908, and 1909, with the reaper and binder. The portion of the plot which was harvested for comparative purposes was one-third of an acre. The grain from each plot was weighed as it came from the winnower. From the weights thus obtained, the yields per acre have been computed, and are given in the following tables :—

WITH MOULD-BOARD PLOUGH,
except Check plots, which were ploughed with Disc plough.

WITH DISC PLOUGH.

Plan in 1907-8-9. In 1910 all plots were fertilised.	Plan in 1905-6.				Plan in 1905-6.	Plan in 1907-8-9. In 1910 all plots were fertilised.
Fertiliser 8-inch deep. Check plot.	No fertiliser 8-inch deep.		4	4	No fertiliser 8-inch deep.	Fertiliser 8-inch deep. Check plot.
No fertiliser 8-inch deep and subsoiled.	Fertiliser 8-inch deep.		3	3	Fertiliser 8-inch deep.	No fertiliser 8-inch deep.
Fertiliser 8-inch deep and subsoiled.	No fertiliser 8-inch deep.		2	2	No fertiliser 8-inch deep.	Fertiliser 8-inch deep.
Fertiliser 8-inch deep Check plot.	Fertiliser 8-inch deep.	C VI	1	1 D VI	Fertiliser 8-inch deep.	Fertiliser 8-inch deep. Check plot.
No fertiliser 8-inch deep.	No fertiliser 6-inch deep.		4	4	No fertiliser 6-inch deep.	No fertiliser 8-inch deep and subsoiled.
Fertiliser 8-inch deep Check plot.	Fertiliser 6-inch deep.		3	3	Fertiliser 6-inch deep.	Fertiliser 8-inch deep. Check plot.
Fertiliser 6-inch deep.	No fertiliser 6-inch deep.		2	2	No fertiliser 6-inch deep.	Fertiliser 6-inch deep
No fertiliser 6-inch deep.	Fertiliser 6-inch deep.	C V	1	1 D V	Fertiliser 6-inch deep.	No fertiliser 6-inch deep.
Fertiliser 8-inch deep Check plot.	No fertiliser 4-inch deep.		4	4	No fertiliser 6-inch deep.	Fertiliser 8-inch deep. Check plot.
Fertiliser 4-inch deep.	Fertiliser 4-inch deep.		3	3	Fertiliser. 4-inch deep.	Fertiliser 4-inch deep.
No fertiliser 4-inch deep.	No fertiliser 4-inch deep.		2	2	No fertiliser 4-inch deep.	No fertiliser 4-inch deep.
Fertiliser 8-inch deep Check plot.	Fertiliser 4-inch deep.	C IV	1	1 D IV	Fertiliser 4-inch deep.	Fertiliser 8-inch deep. Check plot.

PLAN A.—Sketch showing arrangement of Plots in Ploughing Experiment, Cowra Experiment Farm, as carried out in 1905-6 and 1907 to 1910. Width of Plots, 50 links; length, 1,060 links.

TABLE I.—Results, 1905–6.

Plot. 1905.	Plot. 1906.	Variety.		Treatment of Plot.	1905. Computed Bushels, per acre.	1906. Computed Bushels, per acre.
C IV 1 ...	F IV 1 ...	Bobs ...	Disc Plough.	4 inches deep. Fertilised ..	9·50	21·00
,, 2 ..	,, 2 ...	,, ...		4 ,, Not ,,	10·00	20·10
,, 3 ...	,, 3 ...	,, ..		4 ,, Fertilised ...	10·00	20·70
,, 4 ...	,, 4 ...	,, ...		4 ,, Not ,,	9 50	——
C V 1 ...	F V 1 ...	,, ...		6 ,, Fertilised ...	8·85	21·80
,, 2 ...	,, 2 ...	,, ..		6 ,, Not ,,	8·75	21·40
,, 3 ...	,, 3 ...	,, ...		6 ,, Fertilised ...	8·45	21·30
,, 4 ..	,, 4 ...	,, ...		6 ,, Not ,,	8·35	20·90
C VI 1 ...	F VI 1 ...	,, ...		8 ,, Fertilised ...	10·30	23·70
,, 2 ...	,, 2 ...	,, ...		8 ,, Not ,,	11·90	22·30
,, 3 ...	,, 3 ...	,, ..		8 ,, Fertilised ...	10·25	20·90
,, 4 ..	,, 4 ...	,, ..		8 ,, Not ,,	9·55	21 30
D IV 1 ...	G IV 1 ...	,, ...	Mould-board Plough.	4 ,, Fertilised ...	14·00	20·50
,, 2 ...	,, 2 ...	,, ...		4 ,, Not ,,	13·20	21·10
,, 3 ...	,, 3 ...	,, ...		4 ,, Fertilised ...	15·00	19·30
,, 4 ...	,, 4 ...	,, ...		4 ,, Not ,,	13·45	——
D V 1 ...	G V 1 ...	,, ...		6 ,, Fertilised ...	17·20	21·90
,, 2 ...	,, 2 ...	,, ...		6 ,, Not ,,	15·20	24·20
,, 3 ...	,, 3 ...	,, ...		6 ,, Fertilised ...	15·40	21·60
,, 4 ...	,, 4 ...	,, ...		6 ,, Not ,,	15·60	19·50
D VI 1 ...	G VI 1 ...	,, ...		8 ,, Fertilised ...	17·55	24·00
,, 2 ..	,, 2 ...	,, ...		8 ,, Not ,,	15·00	24·20
,, 3 ...	,, 3 ...	,, ...		8 ,, Fertilised ...	15·50	22·70
,, 4 .	,, 4 ...	,, ...		8 ,, Not ,,	14·60	21·50

TABLE IA.—Average Results, 1905–6.

Variety.		Treatment of Plot.	Average Computed Bushels, per acre.	Average, per cent.
Bobs	Disc Plough.	4 inches deep. Fertilised	15·30	93·98
,, ...		4 ,, Not ,, ...	13·20	81·08
,, ...		6 ,, Fertilised	15·10	92·75
,, ...		6 ,, Not ,, ...	14·85	91·21
,, ...		8 ,, Fertilised	16·28	100·00
,, ...		8 ,, Not ,, ...	16·26	99·87
,, ...	Mould-board Plough.	4 ,, Fertilised	17·20	105·65
,, ...		4 ,, Not ,, ...	15·91	97·72
,, ...		6 ,, Fertilised	19·02	116·83
,, ...		6 ,, Not ,, ...	18·62	114·37
,, ...		8 ,, Fertilised	19·93	122·42
,, ...		8 ,, Not ,, ...	18·82	115·60

TABLE II.—Results

Plot. 1907 and '9.	Plot. 1908 and '10.	Variety.	Treatment of Plot.			
C IV 1 ..	F IV 1 ..	Comeback ..	Disc ploughed .. .. Check.	8-in. deep	..	.. Fertilised ..
„ 2 ..	„ 2 ..	„ ..	„ „	4-in. „	..	..*Not fertilised ..
„ 3 ..	„ 3 ..	„ ..	„ „	4-in. „	..	.. Fertilised ..
„ 4 ..	„ 4 ..	„ ..	„ „ .. .. Check.	8-in. „	.. ..	„ ..
C V 1 ..	F V 1 ..	„ ..	„ „	6-in. „	..	..*Not fertilised ..
„ 2 ..	„ 2 ..	„ ..	„ „	6-in. „	..	.. Fertilised .
„ 3 ..	„ 3 ..	„ ..	„ „ .. .. Check.	8-in. „	.. ..	„ ..
„ 4 ..	„ 4 ..	„ ..	„ „	8-in. „	..	..*Not fertilised ..
C VI 1 ..	F VI 1 ..	„ ..	„ „ .. . Check.	8-in. „	..	.. Fertilised ..
„ 2 ..	„ 2 ..	„ ..	„ „	8-in. „	and subsoiled	„ ..
„ 3 ..	„ 3 ..	„ ..	„ „	8-in. „	„	..*Not fertilised ..
„ 4 ..	„ 4 ..	„ ..	„ „ .. .. Check.	8-in. „		.. Fertilised ..
D IV 1 ..	G IV 1 ..	„ ..	„ „ .. .. Check.	8-in. „		.. „ ..
„ 2 ..	„ 2 ..	„ ..	Mould-board ploughed	4-in. „		..*Not fertilised ..
„ 3 ..	„ 3 ..	„ ..	„ „	4-in. „		.. Fertilised .
„ 4 ..	„ 4 ..	„ ..	Disc ploughed .. .. Check.	8-in. „		.. „ ..
D V 1 ..	G V 1 ..	„ ..	Mould-board ploughed	6-in. „		..*Not fertilised ..
„ 2 ..	„ 2 ..	„ ..	„ „	6-in. „		.. Fertilised ..
„ 3 ..	„ 3 ..	„ ..	Disc ploughed .. .. Check.	8-in. „		.. „ ..
„ 4 ..	„ 4 ..	„ ..	Mould-board ploughed	8-in. „	and subsoiled	*Not fertilised ..
VI 1 ..	G VI 1 ..	„ ..	Disc ploughed .. .. Check.	8-in. „		.. Fertilised ..
„ 2 ..	„ 2 ..	„ ..	Mould-board ploughed	8-in. „		.. „ ..
„ 3 ..	„ 3 ..	„ ..	„ „	8-in. „		..*Not fertilised ..
„ 4 ..	„ 4 ..	„ ..	Disc ploughed .. .. Check.	8-in. „		.. Fertilised ..

* Fertilised in 1910.

N.B.—On 14th December, 1909, the whole of the crop on this experiment was destroyed by a bush-fire.

In 1907, a portion of the crop (that ploughed with the mouldboard plough) on this experiment was mixed by a windstorm, so that the yields of the individual plots could not be obtained.

1907-8-9 and 10.

1907—Yield.					1908—Yield.					1910—Yield.				
Bushels per Acre.		Natural.	Percentage.		Bushels per Acre.		Natural.	Percentage.		Bushels per Acre.		Natural.	Percentage.	
Computed.	Average.	Bushels.	Yearly.	Average.	Computed.	Average.	Bushels.	Yearly.	Average.	Computed	Average.	Bushels.	Yearly.	Average.
27·1	27·1	27·1	100·00	100·00	18·40	22·75	18·40	100 00	100·00	28·65	24·71	28·65	100·00	100·00
23·4	23·4	27·3	85·71	85·71	16·50	19·95	18·83	87 62	86·665	27·50	25 06	28·35	97 00	100·00
28·7	28·7	27·5	104·36	104 36	19·00	23·85	19·26	98·64	101·50					
27·7	27·7	27·7	100·00	100·00	19·70	23·70	19 70	100·00	100·00	28·05	25·15	28·05	100·00	100·00
26·9	26·9	27·56	97·60	97·60	18·10	22·50	19·10	94·76	96·18	27·17	24·95	28·07	96·79	101·78
28·0	28·0	27·43	102·07	102·07	19 70	23 85	18·50	106 40	104·28					
27·3	27·3	27·3	100·00	100·00	17·90	22·60	17·90	100·00	100·00	28·10	24·43	28·10	100·00	100·00
27·5	27·5	27.85	98·74	98·74	20·30	23·90	18·45	110·03	104·38	28·75	25·51	27·95	102 86	103·87
28·4	28·4	28·4	100·00	100·00	19·00	23·70	19·00	100·00	100·00	27·80	25·06	27·80	100 00	100 00
28·7	28·7	28·14	101·99	101·99	16·40	22·50	18·30	89·61	95·80	28·35	24·48	27·05	104·80	98·80
27·5	27·5	27·87	98·67	98 67	15·50	21·50	17·60	88·06	93·365					
27·6	27·6	27·6	100·00	100·00	16 90	22·25	16·90	100·00	100·00	26·30	23·60	26 30	100·00	100·00
..	..	..	..	..	19·70	19·70	19·70	100 00	100·00	29·45	24·57	29 45	100·00	100·00
..	..	..	..	..	19·00	19·90	18·64	101·93	101·93	28·75	22·87	29·55	97·29	97·02
..	..	..	.	..	17·00	17·00	17·57	96·76	96·76					
..	.	..	..	..	16·50	16·50	16·50	100·00	100·00	29·65	23·07	29·65	100·00	100·00
..	..	..	..	..	16·10	16·10	16·77	96·00	96·00	31·17	23·78	30·02	103·83	100·08
..	..	..	..	..	16·40	16·40	17·04	96·34	96·34					
..	..	..	..	..	17·30	17·30	17·30	100·00	100·00	30·40	23·85	30·40	100·00	100·00
..	..	..	..	..	17·40	17·40	16·85	103·26	103·26	29·75	23·57	29·67	100·27	101·76
..	..	..	..	..	16·40	16·40	16·40	100·00	100·00	28·95	22·67	28·95	100·00	100·00
..	..	..	..	..	15·40	15·40	16·16	95·30	95·30	29·80	22·60	28·67	103·94	99·62
..	..	..	..	..	18·10	18·10	15·93	113·62	113·62					
..	..	..	..	..	15·70	15·70	15·70	100·00	100·00	28·40	22·05	28·4	100·00	100·00

In 1910, all the plots were fertilised, and each two plots ploughed to the same depth, but which had previously been treated differently as regards fertiliser, were treated as one.

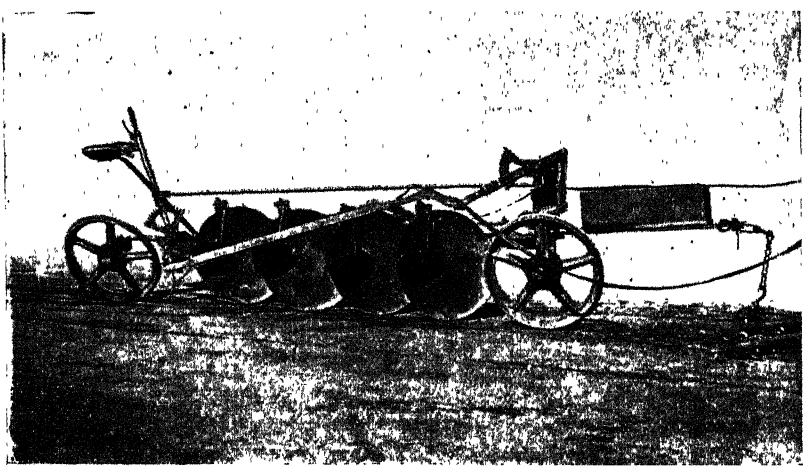
From the above tables the following details are taken :—

TABLE III—Variations due to Type of Plough used.

The average of the results from the fertilised and non-fertilised plots of any particular depth of ploughing has been taken to represent the results from that depth of ploughing.

		1905-6	1907.	1908.	1909.	1910.	Averages. 1905-10.	Averages. 1907-10.
4-in.	Disc plough	87 53	95·03	93·13	...	97·00	93·17	95·05
	Mould-board plough	101·68	..	99·34	...	97·29	99·43	98·31
6-in.	Disc plough	91·98	99·83	100·62	...	96·79	97·30	99·08
	Mould-board plough	115·60	...	96·17	...	103·83	105·20	100·00
8-in.	Disc plough	99·93	99·79	100 91	...	100·26	100·22	100·32
	Mould-board plough	119·01	...	104·46	...	103·94	109·13	104·20

These results are graphically shown on Plate A, from which the relative and comparative variations, due to the type of plough used, can be readily seen.

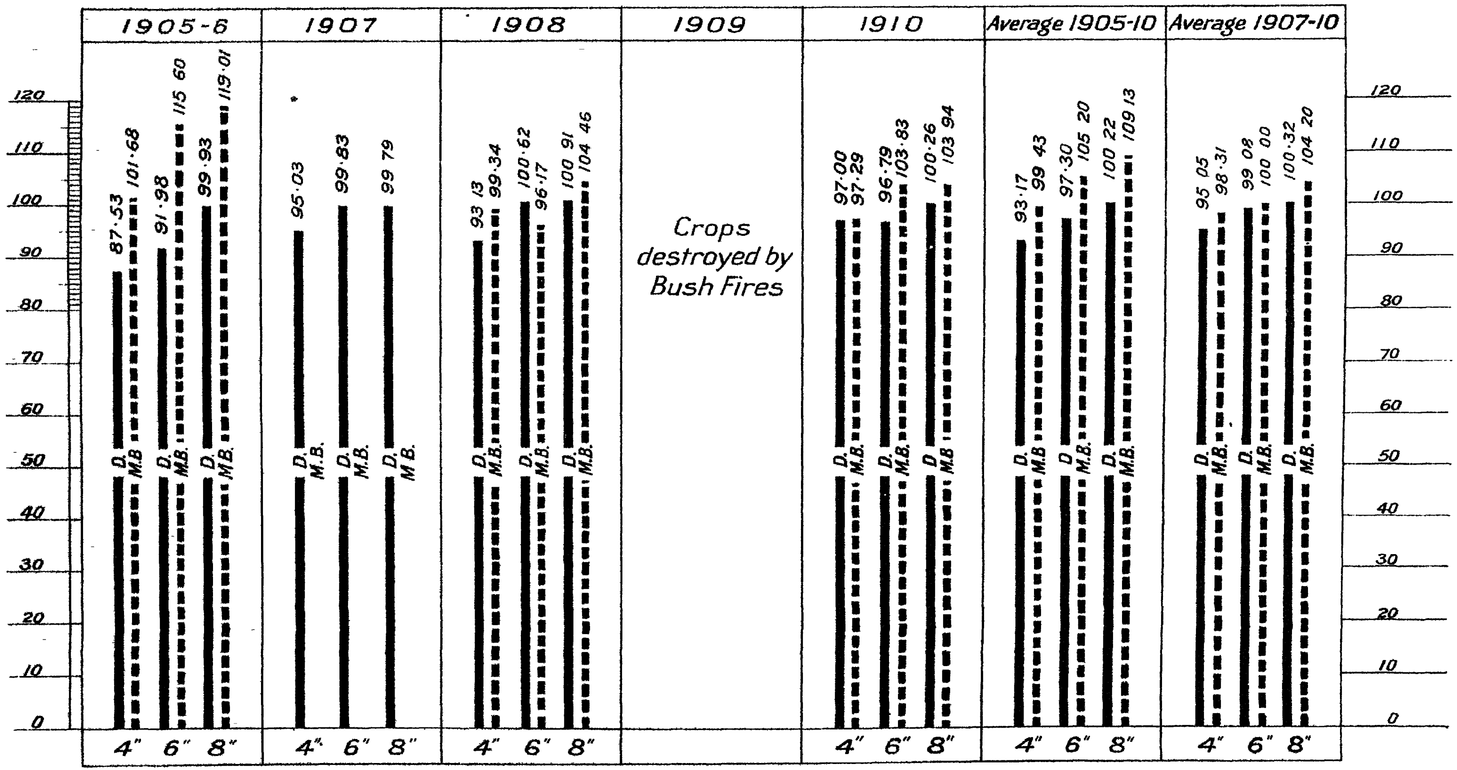


Disc plough used 1909-10.

The average results for the period including the years 1905-6 are given, but it is not proposed to include these two years' results in future years. The ground during this period was quite new and probably uneven, and since then the original arrangement of the plots has been changed.

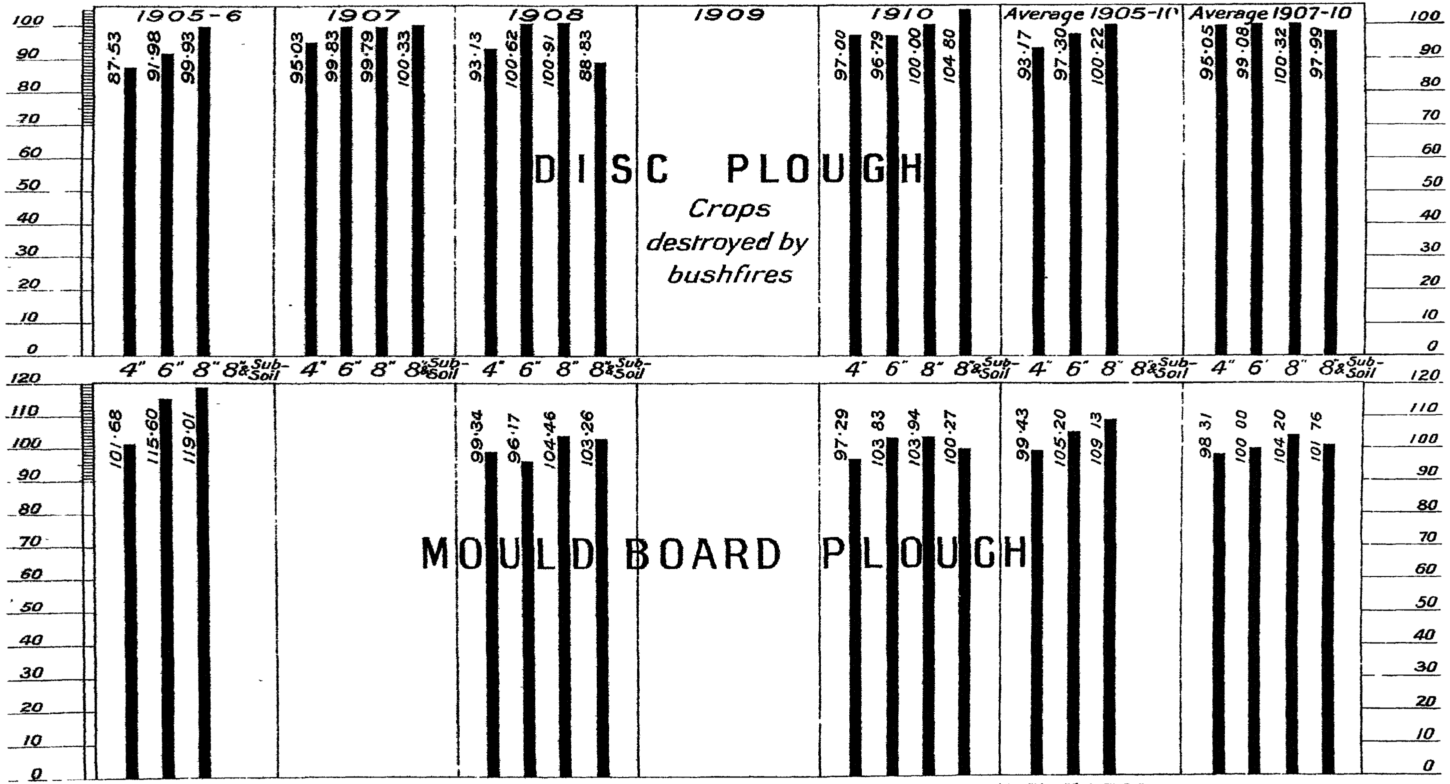
It will be seen that, though not quite consistent, the results are very slightly in favour of the mould-board plough ; and those of the first period indicate that for breaking up new ground, or where the ground is weedy, the mould-board plough has an advantage over the disc

PLATE A.

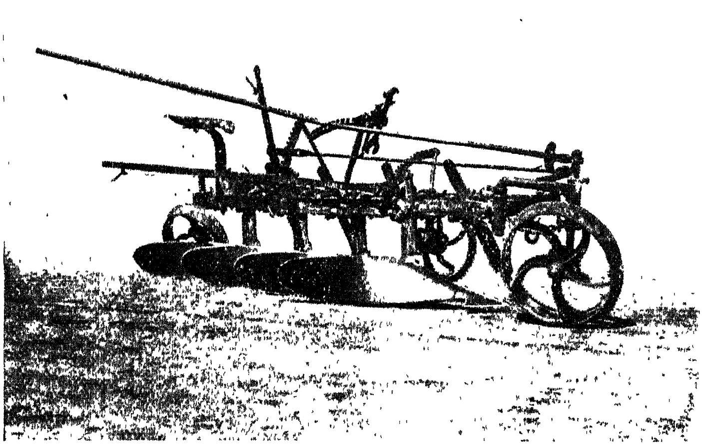


PLOUGHING EXPERIMENTS, COWRA EXPERIMENT FARM.
Showing Variations due to Type of Plough used.

PLATE B.



PLOUGHING EXPERIMENTS, COWRA EXPERIMENT FARM.
Showing Variations due to Depth of Ploughing.



Mould-board plough used 1910.

No analyses have yet been made to determine the effect of the different ploughs upon the composition of the soil. As far as can be seen the effect of both ploughs has been the same on the texture of the soil.

TABLE IV.—Depth to Plough.

The yearly and average variations due to depth ploughed for the whole period of the experiment from 1905 to 1910, and also the average of the variations for the last period (three years) during which the experiment was carried out in its re-arranged form, are as follow :—

Depth of Ploughing.	1905–6.	1907.	1908.	1909.	1910.	Averages. 1905–10.	Averages. 1907–10.
			WITH DISC PLOUGH.				
4 inches	87·53	95·03	93·13	...	97·00	93·17	95·05
6 ,, ...	91·98	99·83	100·62	...	96·79	97·30	99 08
8 ,, ...	99·93	99·79	100·91	...	100·00	100·22	100·32
8 ,, and subsoiled ...	...	100·33	88·83	...	104·80	...	97·99
			WITH MOULD-BOARD PLOUGH.				
4 inches	101·68	...	99·34	...	97·29	99·43	98·31
6 ,, ...	115·60	...	96·17	...	103·83	105·20	100·00
8 ,, ...	119·01	...	104·46	...	103·94	109·13	104·20
8 ,, and subsoiled ...	...	...	103·26	...	100·27	...	101·76

These results are shown in graphic form on Plate B. They indicate that with either plough a very slight advantage is to be gained by ploughing deep rather than shallow; but the differences recorded are so slight that the only conclusions to be drawn are that deep ploughing, some time prior to planting, does not injuriously affect the yield; and that subsoiling has not proved advantageous.

TABLE V.—Effect of Applying Fertiliser.

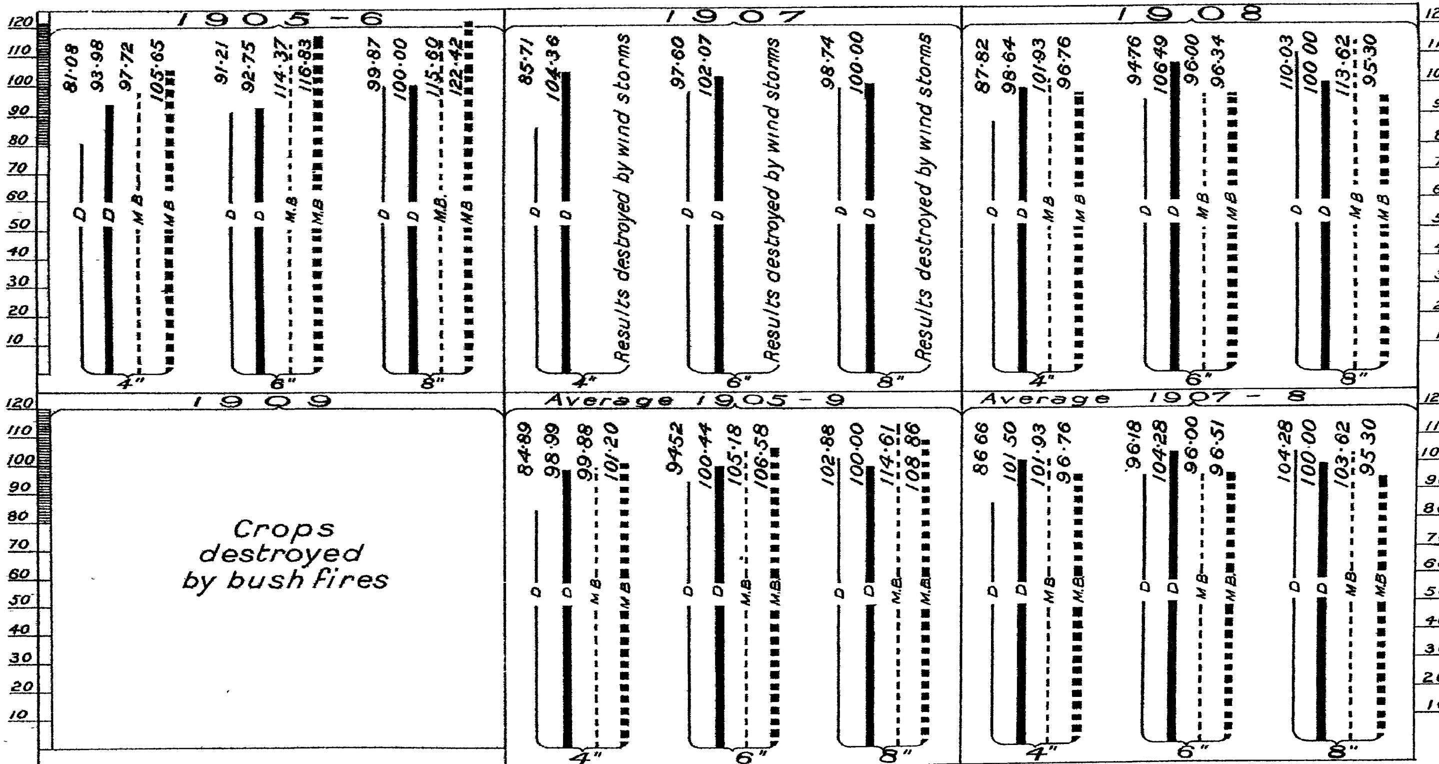
The yearly variations due to the use of fertiliser at the different depths ploughed, also the average of these variations for the whole period, and also for the period after the rearrangement of the plots, are as follow:—

Depth of Ploughing, &c.	1905–6.	1907.	1908.	1909.	Averages. 1905–9.	Averages. 1907–8
Disc. 4 inches, without fertiliser	81·08	85·71	87·62	...	84·80	86·66
Disc. 4 ,, with ,,	93·98	104·36	98·64	..	98·99	101·50
Mould-board. 4 ,, without ,,	97·72	...	101·93	...	99·82	101·93
Mould-board. 4 ,, with ,,	105·65	...	96·76	...	101·20	96·76
Disc. 6 ,, without ,,	91·21	97·60	94·76	...	94·52	96·18
Disc. 6 ,, with ,,	92·75	102·07	106·49	...	100·44	104·28
Mould-board. 6 ,, without ,,	114·37	...	96·00	...	105·18	96·00
Mould-board. 6 ,, with ,,	116·83	...	96·34	...	106·58	96·34
Disc. 8 ,, without ,,	99 87	98·74	110·03	...	102·88	104·38
Disc. 8 ,, with ,,	100·00	100·00	100·00	...	100·00	100·00
Mould-board. 8 ,, without ,,	115·60	...	113·62	...	114·61	113·62
Mould-board. 8 ,, with ,,	122 42	...	95·30	..	108·86	95·30

These results are shown in graphic form on Plate C. They are only consistent in the case of shallow (4-inch) work with the disc plough. They show that the direct application of a fertilizer, even on new land and on ground regularly fertilized, sometimes increases the yield. It would, therefore, seem good business policy to use fertilisers to ensure maximum crops and to prevent the exhaustion of the soil.

The one-way disc cultivator used for cultivating the fallow since 1908.

PLATE C.



PLOUGHING EXPERIMENTS, COWRA EXPERIMENT FARM.

Showing Variations due to Application of Fertiliser.

EXPLANATION. *Disc ploughed, not fertilised* | *Disc ploughed, fertilised* ▮ *Moulboard ploughed, not fertilised* ¦ *Moulboard ploughed, fertilised* ▮

Rainfall.

The rainfall recorded at the farm during the period of the experiment was as follows:—

TABLE VI.—Rainfall at Cowra, 1905–10 (in points).

Year.	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year.
1905	138	189	38	544	174	280	272	161	144	349	155	174	2,618
1906	42	425	443	156	210	262	975	207	496	361	181	176	3,933
1907	234	104	86	146	390	235	152	190	172	143	282	389	2,543
1908	167	395	7	89	99	178	178	140	238	40	123	39	1,693
1909	193	264	115	103	172	256	85	345	152	185	96	99	2,065
1910	318	Nil.	278	4	109	289	369	48	200	126	102	265	2,108

[The results obtained at Coolabah Experiment Farm will be published in next issue.]

CLOSER SETTLEMENT.

THE Department of Lands notify that the following farms are available under the provisions of the Closer Settlement Act:—

Sunny Ridge Estate, Cowra Land District—2 farms available.
Mungery Estate, Parkes Land District—1 farm available.
Brookong Estate, Urana Land District—1 farm available.
Larras Lake Estate, Molong Land District—2 farms available.
Nangus Estate, Gundagai Land District—2 farms available.
Tuppal Estate, Corowa Land District—24 farms available.
Hardwicke Estate, Yass Land District—12 farms available.

Full particulars, maps, &c., may be obtained on application from the Inquiry Branch, Department of Lands, Sydney, or any Crown Land Agent in the State.

"INSECT AND FUNGUS DISEASES OF FRUIT TREES AND THEIR REMEDIES."

THIS pamphlet, compiled by Messrs. Allen, Blunno, Froggatt, and Guthrie, of the Department of Agriculture, may be obtained from the Government Printer, Sydney, price, 1s. It consists of 87 pages royal octavo, and deals with the various classes of fruit-trees in order, insect pests being taken first, then fungus diseases in each case. At the end, the pests of the more common garden vegetables are dealt with in the same way. Directions are given for the preparation of the various insecticides and fungicides recommended, as well as explicit instructions for the fumigation of trees. The pamphlet is freely illustrated, so that no difficulty should be experienced in recognising any pest, and as an index is provided, the whole should form a handy book of reference. No orchardist should be without a copy, as the price is small.

Stack-building.*

M. ATTENBOROUGH.

I BELIEVE in building a fairly large stack, in size about 11 yards by 6, and 14 to 16 feet to the eaves. When commencing the stack I make the foundation as solid as possible for about the first 2 feet. I build with a fork, and from then onwards I never walk on the two outside sheaves, and take particular care to place the whole of the sheaves in the heart of the stack perfectly straight, and packed as tightly as possible. By not walking on the outside sheaves you need not keep the centre any higher than the outside; it is then easier to build on.

In binding the two outside sheaves I keep the butts well back from the bands; the second sheaf not quite so far as the first one. From then to the centre I keep close to bands. As the sheaves you walk on will sink more than the outside row, this will save putting an extra row to keep the centre up. If the centre is getting too high, keep further back from the bands. By keeping the centre solid and the outside slack you will find that, although you endeavour to keep your walls as perpendicular as possible, as the pressure increases your walls will take a gradual outward spring, and by the time you reach the eave your stack will be from 6 to 7 feet more in length, and 4 to 5 feet more in width, than at the base. The ends of the stack always spring more than the sides, and every few feet I build an extra row of sheaves across the ends, and just around the corners, to keep the ends as high as the sides when the stack settles. The corners have to be built round to give the outward spring.

I build hip ends to my roof, so that when thatched not one straw will be stained by the weather. Before starting the roof I build two extra rows of sheaves, with ends projecting 9 inches over the walls. In starting the top, I place sheaves lengthwise along the stack, taking care to start from the ends, as far as will equal half the width of the stack; first placing three sheaves side by side, then two, and then one sheaf on top of the other two, making a sloping ridge. I then slope the sheaves in rows round the ridge, working outwards in well-packed rows until the outside is reached. Then I bind from the outside, with sheaves heads outwards, back to the centre. I commence again from the centre with sheaves butts outwards, and proceed until the top is finished, not forgetting to keep the ridge well up as a base to work against. This is what I call a stooked roof, and if reasonably well built it will never let any water enter the stack.

I generally finish my top by placing a couple of rows lengthwise across the stack, and run a wire over with a weight attached to each end. I build all sheaves with butts outwards, except the alternate rows on roof of stack.

Photograph enclosed will show the outward spring, causing the water to fall clear of the stack.

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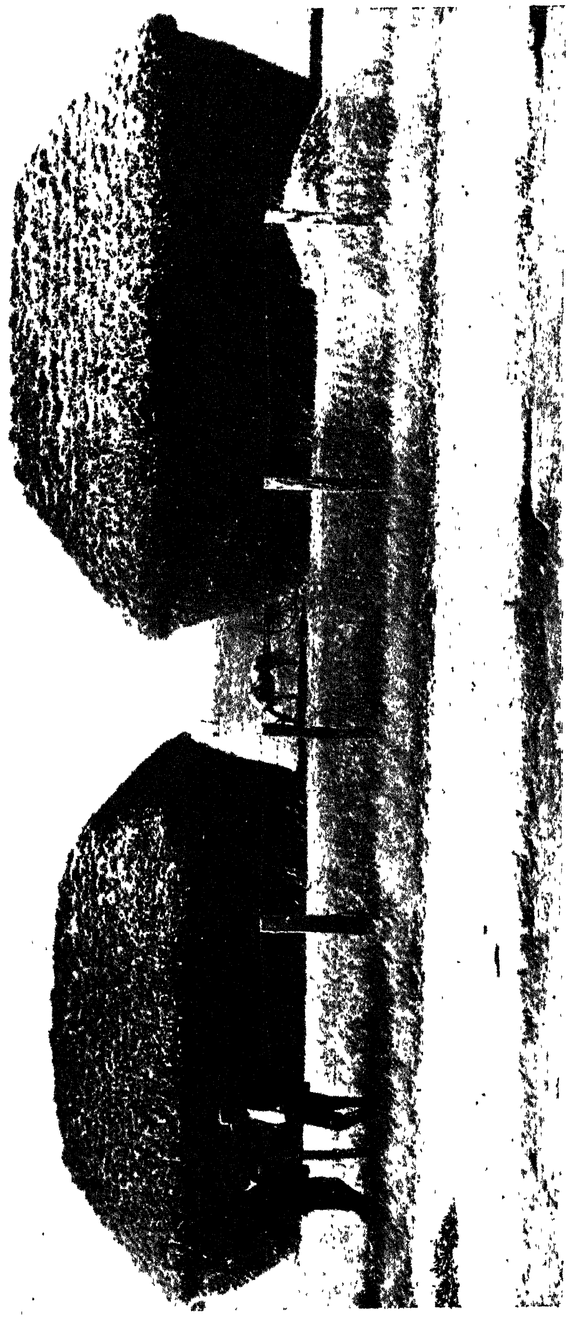
* Extract from a paper read at the first meeting of the Stockinbingal Branch of the Agricultural Bureau of New South Wales on "Hay-cutting, Stooking, and Stacking."



Stacks built by Mr. M. Attenborough for Mr. A. H. Robinson, Gobbagumbalin, Wagga.

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull	Sire.	Dam	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ..	Pansy 4th (imp.).	Coff's Harbour ...	20 June, '11.
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ...	Berry Melbourne	Melbourne (imp.).	Rum Omelette (imp.).	Berry Farm ...	*
Guernsey ...	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Wyrallah... ...	7 Mar., '11.
,, ...	The King's Mirror.	Calm Prince ..	Vivid (imp.)...	Lismore	10 April, '11.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Dunoon	3 April, '11.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	21 June, '11.
,, ...	Monsieur Beaucaire.	Calm Prince ..	Flaxy (imp.)	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Berry Farm ...	*
,, ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 July, '11.
Ayrshire ..	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince	Rosie 5th ...	Grafton Farm ...	*
,, ..	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ..	Jamie's Ayr ..	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd February, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

AYRSHIRE.—Sandy: sire, Auchenbrain Spicy Jock (imp.); dam, Rose Flower; calved 8th April, 1909; colour, brown and white. Price, **£20.**

Rose Flower is from Roseberry, by Daniel of Auchenbrain (imp.). Roseberry from Roseleaf of Barcheskie (imp.), by Mischiefmaker (imp.).

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRES.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

Emerald's Mischief: sire, Prince Emerald (imp.): dam, Miss Prim, by Mischiefmaker of Barcheskie (imp.), from Primrose of Barcheskie (imp.), by Royal Stuart of Glenbuck, from Lindsay 7th of Barcheskie; calved 4th August, 1903; colour, white and red. Price, **£25.**

WOLLONGBAR EXPERIMENT FARM.

JERSEY.—*Lord Cromer: No. 240. Sire, Sir Jack; dam, Lady Kitchener: calved, 30th May, 1910. Price, **£25.**

AYRSHIRES.—*Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved, 27th June, 1910; colour, white and brown. Price, **£15.**

***Cocos:** No. 236. Sire, Auchenbrain's Spicy Jock (imp.); dam, Rose Flower; calved, 29th April, 1910; colour, brown and white. Price, **£20.**

HOLSTEIN.—*Kuperus: No. 235. Sire, Obbe II; dam, Folkye (imp.); calved, 28th April, 1910. Price, **£15.**

GUERNSEY.—Captain Hayes: No. 218. Sire, Prince Souvia; dam, Hayes' Lily du Preel (imp.); calved 31st January, 1910. Price, **£40.**

GRAFTON EXPERIMENT FARM.

RED POLL.—*The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved, 13th February, 1901. Price, **£15.**

HOLSTEIN HEIFERS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Dam.	Sire.	Date of Birth.
Molly	Marjory	Hollander	25 October, 1908.
Florrie	Frolic	President Douwe	5 November, 1908.
Lorene	Lolkye Field	Obbe II	2 March, 1909.
Grace	Lady Grace	do	5 May, 1909.
Lady Holland	Lady Hague	do	13 May, 1909.

Price, £20 each.

PURE-BRED RED POLL COWS FOR SALE.

GRAFTON EXPERIMENT FARM.

Milkmaid	Dairymaid II	His Worship	6 July, 1905.
My Love	Her Loveliness	The Judge	19 March, 1904.

Price, £25 each.

H. C. L. ANDERSON,
Under Secretary.

* **Applications for these bulls will be held till 21st February, 1911. If more than one application be received for any ne bull, his disposal will be decided by ballot.**

Orchard Notes.

W. J. ALLEN.

FEBRUARY.

THE soaking rains which have fallen lately throughout most of our fruit-growing districts will have a beneficial effect on the apple, pear, and stone-fruit crops, as well as on all old orange and lemon trees. I trust that every grower will have his cultivator at work as soon as the soil is dry enough, and the whole of the orchard well worked up in order to put the ground in a good state of tilth, and prevent evaporation

Irrigation.

Many of our fruit-growers would have been happy if, during the dry season, they could have given the trees and crops a thorough irrigation. Some had made provision for such emergencies, and were able to give the trees water when it was necessary, whilst others, perhaps just as favourably situated, failed to avail themselves of the water, which was allowed to run to waste while their trees and crops were badly in need of it. We know that the majority of our growers would find it expensive, or perhaps almost impossible, to make proper provision for such dry times, but there are many on the other hand who, by the expenditure of a little capital and labour, could store sufficient water, either in creeks or dams, as would enable them to give their trees one or two good waterings, or sufficient to help them through such dry summers as those through which we have come of late.

In applying water to the land it should be well soaked to a good depth, and immediately the soil is dry enough, the cultivator should be at work, and the land stirred to a good depth by running the cultivator over at least twice after each irrigation.

Trees or vines which have not had an application for some time will, in all probability, require one this month; but it is best to arrange to give currants, sultanas, and raisin grapes their last watering during the month of January.

Budding.

If trees are in good condition, the first week in this month is the best time for reworking worthless varieties. It will be found that the bud can be inserted more easily underneath than above the limb, and when the buds shoot forth next season, the result will be a nice open centre, and a well-shaped tree. Choose buds from some of the best bearing trees, as only the best is good enough.

Export of Apples.

See that only the best fruit is sent away—that it is neither too green nor too ripe—well classed as to colour and size, and that the wrapping, packing, and stencilling are done in the neatest possible manner, so that when the fruit is opened up for sale in Great Britain it will compare favourably with the fruit from any other State or country. In handling it see that it is kept as cool as possible, and use every care to prevent bruising. Use good, strong, clean, new cases for holding the fruit, and have them neatly and legibly stencilled.

Scales on Citrus Trees.

If trees are weak and out of condition, it is best to defer spraying and fumigating until next month, or at any rate, until after sufficient rain has fallen to bring them back to normal condition, and it will be found that trees fumigated in March will have time to throw off the scale before the fruit is ready to be marketed. Thanks to late rains our citrus trees are all in good condition.

San José Scale.

Deciduous trees infested with San José scale may be sprayed with the resin, soda, and fish oil as soon as the crop is harvested—the sooner now the better.

Codlin Moth.

Continue to fight this—the greatest enemy of the apple-grower—as it is only by united action on the part of apple, pear, and quince growers that we may ever expect to conquer it. Those who have sprayed with arsenate of lead (Swift's) two or more times, and attended to the bandages regularly, report a light percentage of damaged fruit. We still, however, have a number of careless and neglectful growers, who are a menace to their neighbours, and who, by a neglect of these precautions, give our inspectors considerable worry. A good many of these neglected orchards are being weeded out; but there are still scattered orchards which, if they do not receive more systematic attention from the owners or occupiers, will have to be uprooted, as it is the intention of the Department to help the growers in every way possible to fight, and, we hope, to practically wipe out this pest; but this cannot be accomplished while we have growers who bury their infested fruit, or fail to comply with the regulations under the Act. We hope, therefore, that not only will the fruit-growers' unions do all they can to see that every grower does his duty, but that the growers themselves will, when they know of negligence in their neighbourhood, notify either the Department or the local inspector.

Fruit Fly.

The absence of this pest from our orchards this year has made the life of the fruit-grower very much easier, and the neighbouring States need have

very little fear of introducing this pest with any fruit which they may import from this State, as the fly has practically disappeared. In order to prevent its reappearance, however, our growers must continue the work of picking up and destroying (by boiling or burning) of all fallen or infested fruit. If this precaution is strictly carried out, I do not anticipate much more trouble from this unpopular visitant.

Summer Wash for Wooly Aphis.—Resin and Soda Wash.

Dissolve 3 lb. of washing-soda and 4 lb. of finely-powdered resin over a fire, in about 5 pints of water; then add water to make 5 gallons; boil well till the resin is thoroughly dissolved, and the mixture is of a dark-brown colour; then take I gallon of the mixture to 7 gallons of water, and apply hot.

Specimens from Bathurst.

I have to acknowledge from Mr. E. K. Wolstenholme, Montavella, Bathurst, some very fine specimens of Quillin's Early Apricot, and Brigg's Red May Peach. These were packed in wood wool and wrapped in soft tissue paper, surrounded by a neat printed wrapper showing the name of grower, &c.; and although the fruit was ripe, it opened up in excellent condition.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Alstonville A. Society	W. W. Monaghan	Feb. 8, 9
Berry A. Association	C. W. Osborne	„ 8, 9
Moruya A. and P. Society	P. Flynn	„ 8, 9
Coramba District P., A., and H. Society	H. E. Hindmarsh	„ 15, 16
Shoalhaven A. and H. Association (Nowra)	H. Rauch	„ 15, 16
Gunning P., A., and I. Society	J. L. Sands	„ 22, 23
Manning River A. and H. Association (Taree)	S. Whitbread	„ 22, 23
Ulladulla A. Association (Milton)	J. Boag	„ 22, 23
Kangaroo Valley A. and H. Association	J. Moffit	„ 23, 24
Nambucca A. and H. Association	E. M. Walker	„ 23, 24
Wyong A. Association	J. H. Kay	„ 23, 24, 25
Central Cumberland A. and H. Association (Dural)	H. A. Best	„ 24, 25
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	„ 28, Mar. 1, 2
Inverell P. and A. Association	J. McIlveen	„ 28, Mar. 1, 2, 3
Braidwood P., A., and H. Association	L. Chapman	Mar. 1, 2
Bega A., P., and H. Society	T. W. A. Zingel	„ 1, 2, 3
Robertson A. and H. Society	R. J. Ferguson	„ 2, 3
Bowraville A. Association	C. Moseley	„ 2, 3
Gundagai P. and A. Society	A. Elworthy	„ 7, 8
Bangalow A. and I. Society	W. H. Reading	„ 7, 8, 9

Society.	Secretary.	Date.
Tenterfield P., A., and M. Society	F. W. Hoskin ...	Mar. 7-11
Bombala Exhibition Society	W. G. Tweedie ...	,, 8, 9
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 8, 9
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks ...	,, 8, 9, 10
Crookwell A., P., and H. Society (Annual Show) ...	M. P. Levy ...	,, 9, 10
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 9, 10
Nepean District A., H., and I. Society (Penrith) ...	P. C. Smith ...	,, 9, 10
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 9, 10
Central New England P. and A. Association (Glen Innes)	G. A. Priest ...	,, 14, 15, 16
Campbelltown A. Association	F. Sheather ...	,, 15, 16
Cobargo A., P., and H. Society	T. Kennelly ...	,, 15, 16
Tumut A. and P. Association	T. E. Wilkinson...	,, 15, 16
Bellinger River A. Association (Bellingen)	S. S. Hindmarsh	,, 15, 16, 17
Mudgee A. Society	H. Lamerton ...	,, 15, 16, 17
Quirindi District P., A., and H. Association	G. Haughton ...	,, 15, 16, 17
Port Macquarie and Hastings District A. and H. Society	W. R. Stacy ...	,, 16, 17
Goulburn A., P., and H. Society	J. J. Roberts ...	,, 16, 17, 18
Armidale and New England P., A., and H. Association	A. McArthur ..	,, 21-24
Molong Agricultural Society	W. J. Windred ..	,, 22
Camden A., H., and I. Society...	C. A. Thompson...	,, 22, 23, 24
Clarence P. and A. Society (Grafton)	T. T. Bawden ...	,, 22, 23, 24
Taralga A., P., and H. Association	G. C. Goodhew ..	,, 23, 24
Wauchope P., A., and H. Association	A. D. Suters ...	,, 23, 24
Newcastle A., H., and I. Association (Annual Show)	C. W Donnelly...	,, 23, 24, 25
Blayney A. and P. Association	E. J. Dann ...	,, 28, 29
Lower Clarence A. Society (Maclean)	F. W. Collison ...	,, 28, 29
Walcha P. and A. Association	J. New-Campbell	,, 28, 29
Narrabri P., A., and H. Association	H. R. Thurlow ...	,, 28, 29, 30
Adaminaby P and A. Association	Wm. Delany ...	,, 29, 30
Liverpool A. H. and I. Society	W. E Learoyd ...	,, 29, 30
Yass P. and A. Association	W. Thomson ...	,, 29, 30
Luddenham A. and H. Society...	F. Shawe... ...	April 4, 5
Cooma P. and A. Association	C. J. Walmsley ...	,, 5, 6
Dorrigo A. Society	F. T. Stennett ..	,, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 5, 6, 7
Royal A. Society of N.S.W. (Sydney)...	H. M. Somer ...	,, 11-19
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Bathurst A., H., and P. Association	A. H. Newsham...	,, 26, 27, 28
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Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 4, 5, 6
Dungog A. and H. Association...	C. E. Grant ...	,, 10, 11
Hay P. and A. Association	G. S. Camden ...	July 11, 12
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Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton ...	,, 29, 30, 31
Young P. and A. Association	G. S. Whiteman...	Sept. 5, 6, 7
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Cootamundra A., P., H., and I. Association ...	T. Williams ...	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 12, 13, 14
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Temora P., A., H., and I. Association	J. Clark	,, 19, 20, 21
Ganmain A. and P. Association	J. H. Ashwood ...	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther...	Oct. 4

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Agricultural Gazette of New South Wales.

Inferior Soils in the Grafton-Casino District.

H. C. L. ANDERSON.

ALONG the railway line between Casino and Grafton the traveller may see large areas of comparatively poor upland soil, which are held in low esteem by the local men who have been used to the rich alluvial soils of the Clarence River. It is natural that they, being accustomed to growing heavy crops of potatoes and maize, should despise these light and rather hungry soils, which certainly grow good timber but give grazing of only medium quality. At the same time there are thousands of persons in this State cultivating soils much inferior chemically and mechanically, more especially in the County of Cumberland and amongst the sandstone formations along the coast district.

The soil in the area occupied by the Grafton Experiment Farm is generally of good quality, but the Department has recently acquired a part of the adjacent common, the soils of which are thoroughly typical of those of much inferior quality on the uplands of this district. It is intended to demonstrate on this area what can be done in the way of growing fodder crops by judicious manuring and by the use of a good rotation, including leguminous crops suited to the district. The first batch of settlers who are now beginning to realise the comparative worth of this soil, especially in view of the very low price at which it is offered by the Crown, will be interested in the analyses which have been made in the Chemist's Branch of this Department.

The two samples were taken from 50 acres opposite the Aboriginal Settlement. One is representative of the poorest soils in the district; it is covered with ti-tree scrub, is shallow, and has rather a cold clay subsoil, showing a good deal of ironstone gravel. It is light in colour, strongly acid in reaction, sandy in its nature, and the capacity for water is very low, 29 per cent.; the capillary power in such light soil being naturally very good, 7·5 inches. It contains fine gravel, 10·4 per cent.; sand, 71·3 per cent.; and impalpable matter, chiefly clay, 8·3 per cent. The volatile and combustible matter is very low, 2·16 per cent.; the nitrogen is equal to ·056 per cent., which is estimated for comparative purposes as "fair." The lime, ·076 per cent., is "deficient"; the potash, ·051 per cent., is "fair"; the phosphoric acid, ·063 per cent., being also "fair."

This soil cannot be called rich, and it is not even of second-class quality, but it is kindly in its nature, easily worked, and has a fair proportion of all the elements of fertility except lime. With the addition of lime and the use of a moderate dressing of bonedust, this soil can be made to grow good crops, and will, after demonstrations of its value, be held in much higher esteem than at present. It will be immensely benefited if its humus can be

increased by ploughing in any green crops such as cowpeas, but better economic results would probably be obtained by feeding them off and returning to the soil probably 75 per cent. of their fertilising elements in the resultant manure."

This soil is superior to the average fruit-growing soil in the neighbourhood of Sydney; and after the green timber has been killed for several years, and it has been thereby sweetened, and also still further by cultivation for several years, it will grow good grass and very good fodder crops, with the aid of moderate dressings of bonedust.

The other soil, which is darker in colour and deeper, represents a higher quality. It is also strongly acid in reaction, but has a fair capacity for water, 36 per cent.; while the capillary power is good, 5·5 inches. It contains 17 per cent. fine gravel, 64 per cent. sand, and 18·2 per cent. impalpable matter, chiefly clay. The volatile and combustible matter is more than twice as good as is the other soil, being 4·91 per cent. The proportions of fertilising substances are generally fair, nitrogen being ·077 per cent., "fair"; lime, ·145 per cent., "satisfactory"; potash, ·05 per cent., "fair"; and phosphoric acid, ·088 per cent., "fair."

This soil is equal in quality to the loam formed from the decomposition of Wianamatta shale in the County of Cumberland, a good type of which may be seen on the Western railway about Seven Hills and Blacktown, and on which oranges and other fruit of excellent quality are being grown. Such land was lately available in the neighbourhood of the Casino–Grafton railway line at 15s. per acre, and with the good supply of useful timber on it, which would provide present fencing and farm buildings and leave a surplus for future years, no one who selected it should ever have cause to regret taking 640 acres at the price. It must be manured, preferably with bonedust, and the vegetable matter must be conserved, and if possible increased by growing and ploughing in or feeding off cowpeas, velvet beans, Mauritius beans, and other suitable fodder crops, preferably leguminous. Under scientific treatment this soil will give very satisfactory results in a system of mixed farming with a rotation of crops suitable for the district, and in view of the satisfactory rainfall of the locality, is much better than a large proportion of the soils which are now being successfully cultivated in other districts of this State and in other countries of the world.

Contributions to the Farrer Memorial Fund.

Name.	Address.	Amount. £	s.	d.
Amount received up to 21st January, 1911 ...		997	3	1
Gillespie Bros., Flour Millers ...	Sydney ...	10	0	0
Sir F. B. Suttor ...	Sydney ...	2	2	0
Farmers' Union ...	Boree Creek ...	2	2	0
		£1,011	7	1

Treatment of Seed Wheat for Smut or Bunt.

THE Department of Agriculture has decided to recommend farmers to treat their seed wheat for smut (bunt) this year by steeping it in solutions of bluestone and lime. This decision was arrived at as one of the results of the Departmental Wheat Conference, held on 17th and 18th January, to consider several matters connected with wheat-growing and kindred subjects, and a *resumé* of the reasons which led to the decision was ordered to be published in the *Gazette* for the information of wheat-growers.

When this important subject was reached, Mr. Sutton explained the circumstances which induced him to tentatively recommend the use of bluestone and salt last year, a recommendation which was subsequently withdrawn by notice in the *Gazette* for September, 1910. Some two years ago, when on a visit to the Mallee district of Victoria, Mr. Sutton found that a practice of farmers around Sea Lake was to use salt water from the lake with which to make the bluestone solution, and excellent results were reported. Mr. D. McAlpine, Vegetable Pathologist of the Victorian Department of Agriculture, had publicly stated that salt had no appreciable effect as a fungicide; and as the practice was exciting the interest of farmers on this side of the Murray, Mr. Sutton decided to make a field test at Cowra, to ascertain what foundation there was for this practice. As he was testing other fungicides at the same time, he decided to try the effect of a saturated solution of coarse salt and water, as well as of a 2 per cent. solution of bluestone to which was added sufficient salt to make a saturated solution.

The influence of each of the several fungicides was examined from three points of view—the destruction of smut spores on the seed grain; the effect upon the vitality of the grain; and the prevention of reinfection with smut. It was found that salt water had very little effect in the destruction of the bunt spores, confirming Mr. McAlpine's opinion; but Mr. Sutton was surprised to find that bluestone and salt destroyed a larger percentage of the bunt spores than any other fungicide tried; that its effect upon the germination of the grain was not at all serious; and that as a preventive of reinfection after treatment it held first place—though in the last-named section of the experiment a large percentage of the grain failed to germinate. In view of all the results, Mr. Sutton made the tentative recommendation that equal parts of bluestone and salt be used to make the pickling solution. This recommendation was followed last season by the officers of the Experiment Farms, by the Chief Inspector's staff in treating seed for the Farmers' Experiment Plots, and by a large number of the farmers who will read these notes. The results were variable. In some places they were all that could be desired; in others the effect upon the germination of the treated seed was very serious. The causes of the variation are not definitely known, and the

conditions under which the treatment is injurious cannot be clearly laid down. The earliest opportunity was, therefore, taken to cancel the recommendation. But that there were ample grounds for the suggestion is clearly proved by the fact that at Cowra Farm crops ranging from 30 to 36 bushels per acre have now been harvested from areas up to 10 acres each, sown with seed treated with bluestone and salt. One prominent Western Riverina farmer, moreover, states that he used no other treatment last year, and that he had the best crop he has ever grown.

In recommending bluestone and lime, the officers present at the Conference have reverted to a fungicide which has consistently given good results in both the experiment plots and in the paddock. The principles of its action are very simple. The bluestone kills the smut spores upon the grain. Bluestone (sulphate of copper) is a well-known and well-tried fungicide, destructive to nearly all forms of fungus life. It is used by the orchardist to make the famous spray known as Bordeaux Mixture, and it forms the basis of several other remedies for fungus diseases. But if it is applied alone to smutty wheat it forms a coating around the grain, and when the seed begins to grow this coating of bluestone is very injurious to the young shoots and roots. It must, therefore, be removed before the seed is permitted to germinate. A very simple method of doing this has been suggested by Mr. Peacock. The seed may be allowed to stand for an hour or two after dipping in bluestone solution, so as to ensure that all the smut spores are killed, and then dipped into cold water to wash off the bluestone. This has been found effective at both Bathurst and Cowra farms; but a fatal objection to its use in dry districts is the fact that a large quantity of water is required. The water soon becomes saturated with bluestone and has to be replaced, as its virtue in dissolving the coating of bluestone on the grain has gone. Water is not plentiful in the bulk of the wheat areas.

A better method is to dip the bluestoned wheat into a solution of lime. The lime combines chemically with the bluestone and neutralises its destructive properties. The quantity of water necessary is, therefore, much less.

Some scientific investigations recently made at the Woburn Experiment Farm in England, by Pickering, resulted in the statement that milk of lime (lime *suspended* in water) is not so efficient nor economical to use with bluestone as lime-water (lime *dissolved* in water). Lime-water would be obtained by decanting the water from the lime as a perfectly clear fluid; milk of lime is made by simply slacking fresh lime in water. Pickering's discovery is being tested by the Department in another connection. At present it cannot be recommended to farmers in treating wheat for smut, partly because it has not been sufficiently tested, and partly because a farmer could not always be quite sure that his lime is perfectly unslacked. If air or water has acted upon the lime since it has been burnt, it may be converted into carbonate of lime, when Pickering's method will give nothing but pure water. The Department, therefore, recommends, for the present at any rate, the use of freshly-burnt lime mixed with water. This is commonly known as "lime-water," but it is really a mixture of lime and water.

The actual method of applying the bluestone and lime treatment is given below by Mr. Sutton, as a revision of the article published in the *Gazette* of May, 1909. Since that date considerable attention has been given to the subject by Mr. G. P. Darnell-Smith, of the Bureau of Microbiology, and one of the results of his work has been that attention is drawn to the little tuft of hairs on the brush of the wheat grain. This imprisons many of the tiny smut spores, as well as a quantity of air; and the air must be displaced before the bluestone can act upon the spores.

With regard to formalin, the standard American treatment, it must be explained that the formalin solution is simply water containing a gas in solution. The fungicide is the gas. As applied in this State, the wheat is dipped into the solution. The American method is to sprinkle the wheat with the solution and then cover it up with bags, so that the gas can work upon the smut. This is found too cumbersome for practical use by our farmers.

All these and many more matters were discussed at the Conference, and the unanimous opinion was that bluestone and lime was the best treatment for farmers' conditions. It is simple and certain, and a farmer adopting it may be reasonably sure of having no appreciable amount of smut in his crop.

TREATMENT FOR SMUT.

GEO. L. SUTTON, Wheat Experimentalist.

The wheat-grower is troubled with two pests known as Smut. They are Bunt or Stinking Smut, and Loose or Flying Smut. When, however, the farmer talks about "smut," he is almost without exception referring to Bunt or Stinking Smut, so called from the objectionable smell it has, and which is quite noticeable even if only a little be present in a large quantity of grain.

There are considerable differences between the two smuts; but, from the wheat-grower's standpoint, the chief one is that "smut" (Bunt) can be readily prevented by treating the seed-wheat before it is sown, whilst "loose smut" requires special treatment of the seed for its prevention in the resulting crop.

As "loose smut" requires special treatment of the seed-grain for its prevention, the most practical way of getting rid of it, after it has made its appearance on a farm, is to use for seed only grain which is known, as the result of an examination of the growing crop at the proper time, to be entirely free from this disease. *To determine whether "loose smut" is present in a crop the examination should be made when the plants are flowering.*

What is Smut?

In order to understand the reason for treating seed to prevent "smut," it is necessary to know what "smut" is. Some are under the impression that "smut" is a fungus disease which exists in the ground. Such is not the case.

The minute black particles which are found adhering to a wheat grain, and which are commonly called "smut," but which would be more correctly called "bunt," are the seeds or "spores" of a plant, just as the grains of wheat are the seeds of another plant. These spores, unless their vitality is destroyed, will, when sown with the wheat, germinate and grow with the wheat plant, living upon its tissue, and be the cause of the production of a "smutted" wheat ear.

The object of any treatment is to destroy the vitality of these "smut" spores without injuring the vitality of the seed-grain.

It may be thought that the plant may also become affected with "smut" as the result of infection from the ground which has previously had smutty crops growing on it. Experiments have shown that this is not the case, and it is now known that the chief (almost the only) cause of "smut" is the sowing of seed which has healthy spores adhering to it. It follows, therefore, that if the vitality of these spores can be destroyed, or if the plants resulting from the germination of the spores are destroyed, that grain crop will be "clean." Methods have been introduced for successfully destroying the vitality of the spores, but no practical method has yet been devised for killing the "smut" plants after they have germinated. Occasionally, as in the case of self-sown crops, the natural conditions prevailing at the time the seed is planted are the cause of a "clean" crop being produced from untreated smutted seed; but to depend upon this chance method of obtaining clean crops is very unwise and likely to lead to disappointment. It is far wiser and more businesslike to destroy the vitality of the spores, and thus prevent them growing.

Bunt Balls.—The "Pickle" has no effect on the spores contained in the unbroken balls.

Whilst the methods recommended for treating seed-grain will destroy the spores which have become free from the bunt-balls, NONE OF THEM IS EFFECTIVE FOR DESTROYING THE SPORES WHICH ARE CONTAINED IN UNBROKEN BUNT-BALLS. IT IS THEREFORE NECESSARY, IF ANY TREATMENT IS TO BE EFFECTUAL, THAT THE UNBROKEN BUNT-BALLS BE EITHER REMOVED OR BROKEN BEFORE THE SEED IS "PICKLED." If this is not done, the bunt-balls, during the subsequent operation of planting, are likely to become broken, and their uninjured contents dispersed over the treated grain, thus nullifying

the effect of the treatment; for the effect of the treatment is to destroy the spores adhering to the grain; it does not render the grain immune to the attacks of "smut."

It has been calculated that in a single bunt-ball, no larger than a grain of wheat, there are about 4,000,000 spores, each of which is capable of causing one wheat-plant to be smutted. In a bushel of wheat there are 600,000 to 1,000,000 grains. There are, therefore, in a single bunt-ball enough spores, if regularly and evenly distributed, to provide each grain in a bushel of wheat with from four to six spores. The great necessity for removing or breaking the bunt-balls, so that the fungicide can act upon their contents, is obvious.

It is easier to remove the bunt-balls than to ensure that all are broken, and, fortunately, this can be done in most cases without any great difficulty. Bunt-balls are lighter than wheat and float in water, so that if the wheat to be treated is poured slowly into the "pickle," and in such a way that the bunt-balls will not be carried down by the grain, they will float on the top, and can be skimmed off and destroyed. As a further precaution, and in order to release any bunt-balls which may have been carried down by the grain, the grain should be stirred or raked; this is also likely to break up any partially-broken bunt-balls which have sunk and become soft.

Until bunt-resisting varieties have been produced, and are in general cultivation, to ensure clean crops it is advisable to assume that all seed is more or less smutty, and requires to be "pickled," for, seeing that the spores are so minute, it is quite possible for enough to be present on the seed-grain to cause considerable smut in the resulting crop, and yet for their presence to escape notice.

Pickling Wheat with Bluestone.

The Bluestone Treatment.

The most popular fungicide for treating seed-grain, and the one in most general use in this State, is *Bluestone* (copper sulphate). The efficacy of this fungicide depends upon bringing the "smut" spores in contact with a solution of bluestone for a sufficient length of time to destroy their vitality. Various plans are adopted for attaining this object. Whatever method is adopted, it should be done with sufficient thoroughness to ensure that no spores escape coming into contact with the fungicide long enough to destroy their vitality. A weak solution requires a relatively longer time to destroy the spores than a strong one does. At one time it was the common practice to "steep" the seed in a weak solution ($\frac{1}{2}$ per cent.) for twelve hours, but this method has now been almost superseded by methods which require the seed to be "steeped" for a few minutes—three to five—in a stronger solution of, say, 2 per cent.

Bluestone when used alone, and not in combination with lime or lime-water, very injuriously affects the germinating power of the seed. Under some conditions, as much as *half the seed treated is destroyed*, or the vigour of the resulting plants so weakened that they are practically valueless. The *ill effects* can be almost *entirely prevented* by sprinkling the treated seed whilst wet with air-slacked lime or wood ashes, or by immersing it for a few minutes in lime-water. Lime-water is made by mixing *freshly burnt* (lumpy) lime in water, say 2 lb. of unslacked lime in 20 gallons of water. If freshly-burnt lime is not available, the seed should be sprinkled with air-slacked lime or wood ashes. AIR-SLACKED LIME IS NOT SOLUBLE IN WATER, AND THEREFORE LIME-WATER CANNOT BE MADE BY MIXING AIR-SLACKED LIME AND WATER TOGETHER.

The result of the bluestone-lime treatment is that the bluestone solution destroys the "smut" spores, and the lime or lime-water neutralizes the caustic action of the bluestone on the vitality of the grain.

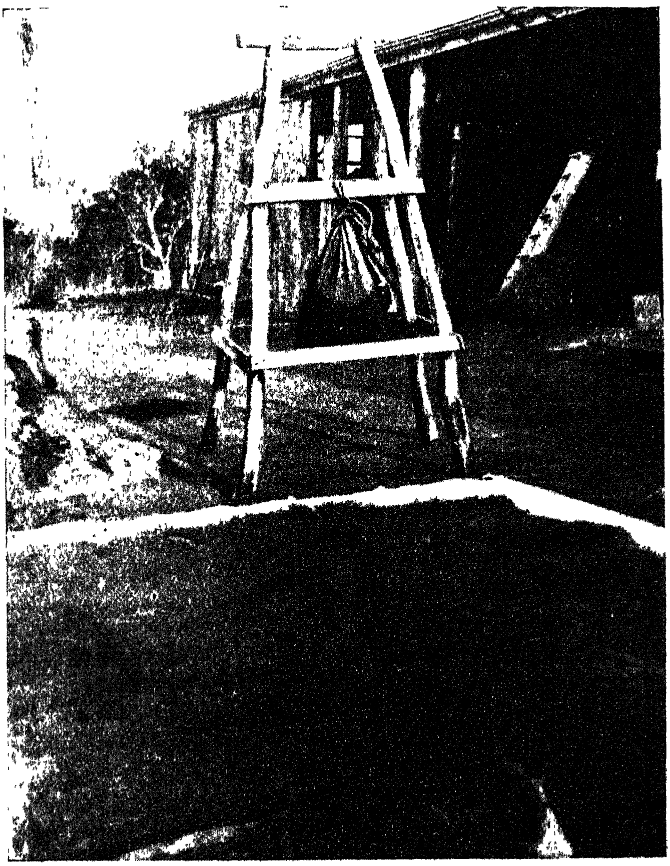
The same results would not be obtained by mixing the lime with the bluestone solution, and then treating the seed with the mixture. In this case the fungicidal action of the bluestone would have been neutralized before being brought in contact with the smut spores. These latter would therefore be treated with a solution having little or no effect upon their vitality.

The details of some methods for treating seed-grain with bluestone are as follows:—

1. Make a solution by dissolving 1 lb. of bluestone in 5 gallons (50 lb.) of water, thus making a 2 per cent. solution. Soak the seed for five minutes; allow the seed to drain, and then immerse the wet grain in lime-water for two or three minutes. When *thoroughly dry* the grain can be planted. Unless thoroughly dry, the seed will not run freely through the drill.

   Instead of immersing the grain in lime-water after its treatment with bluestone, it may be sprinkled with air-slacked lime or wood ashes, which will help to dry it, but this latter method is not recommended when the seed is to be drilled in.

2. Make a solution by dissolving 1 lb. of bluestone in 1 gallon of water (that is, a 10 per cent. solution), and sprinkle this over the contents of a bag of wheat which has been previously emptied on to a wooden floor. During the operation of sprinkling, the wheat should be turned over several times to ensure the grains being evenly and regularly wetted.
3. Make a solution by dissolving ½ lb. of bluestone in 10 gallons (100 lb.) of water. Soak the seed for twelve hours, then dry and sow.



Drying.

The first method is gradually becoming general, though in many cases the supplementary treatment with lime-water is omitted. It is rare to find a farmer adopting the third method, and those who use the second method are becoming comparatively fewer each year. The actual details of the application of this first method vary on different farms, and depend to some extent upon the conveniences available and the ingenuity of the operator. The plan illustrated is a very common one. The wheat, about 2 bushels at a

time, is placed in loosely-tied "butts," and then, by means of a lever, is lowered into the solution, and after remaining in it the necessary time it is raised on to a sloping bench or trough, where the superfluous liquid can drain back into the cask. When the draining is complete, the "butt" is again lowered, by means of the same lever, into the lime-water contained in an adjacent cask, and after remaining for two or three minutes is raised out again and allowed to drain, but in such a position that the superfluous liquid does not run back into either of the casks.

Whilst the bag is in the cask the grain is agitated or shaken about. This is necessary for the following reason:—

In the partially-filled bag the grains of wheat, with their adherent smut spores, have films of air surrounding them. When the bag is suddenly immersed in the liquid many of these air films are imprisoned; and these imprisoned air films will prevent the liquid from coming into contact with the smut spores attached to the grain. As the "pickle" can only destroy the smut spore by saturating it, it becomes necessary to agitate the grain in order to dislodge the air film and afford the pickle an opportunity of saturating the smut spores.

The method as described is quite effective when no unbroken bunt-balls are present amongst the grain. When such are present it is deficient in that no provision is made for their removal. As it is difficult, if not impossible, to say when such are not present, it is advisable to assume that they are mixed amongst the seed grain, and to make arrangements for their removal. This can be done by modifying the method, so as to pour the grain slowly and gradually into the solution rather than to plunge the whole of it, enclosed in a bag, suddenly in the solution. This latter method will allow the unbroken bunt-balls to float and be removed, and will tend to ensure that each wheat grain is thoroughly wetted.

To facilitate the removal of the grain after it has been immersed in the pickle it is recommended that a sheet of hessian (a chaff bag cut open will do) be placed in the cask, so that it forms a large pocket or bag inside the cask, with the edges, which form the mouth, fastened on the outside of the cask. With this sheet, the grain, after it has been treated, can be quickly removed by bringing the corners of the sheet together and lifting the grain out in a mass.

After the grain has drained, it should then be poured on to another sheet or into a bag for immersing in the lime-water. It is not advisable to use the sheet that has been in the lime-water for immersing the grain in the bluestone solution, for it will have lime adhering to it, and the effect of mixing lime with bluestone is to lessen the value of the latter for the destruction of the smut spores.

Another method adopted on some farms is to place the seed-wheat, either loose or in bags, in elevated casks or troughs, and pour the bluestone solution over it. After it has remained on the wheat the necessary time it is run off into another cask or trough placed in a lower position. The troughs used are often made of hollow logs.

After the seed has been treated, it requires some drying before it can be planted with a drill. If the seed has been treated with bluestone only (the supplementary treatment with lime-water having been omitted), and is to be planted within a reasonable time—say, within a week—all that is necessary is to place the "butts" where they can drain freely, when the seed will be ready to sow any time after a few hours. If the planting is not to take place for some considerable time, or if the seed has been treated with lime-water as well as bluestone, it is necessary to dry it thoroughly. This can be done very expeditiously by spreading it out in a thin layer on a sheet or on a floor.

Many farmers go to a considerable amount of *unnecessary* trouble to obtain boiling water in order to dissolve the bluestone used in making up the solutions. Bluestone will readily dissolve in cold water, if treated in the proper way, which is as follows :—The necessary bluestone, after being weighed, should be suspended in an open bag *just below the surface* of the required quantity of water. In a few hours, even in the very coldest weather, the crystals will dissolve without any further attention. If, however, the crystals are placed at the bottom of the vessel containing the water, it will be weeks before they dissolve, unless the water is heated and agitated.

An advantage of the bluestone treatment is that the bluestone solution does not deteriorate, but it can be used over and over again during the whole season. The quantity in the cask or other vessel becomes less on account of a certain quantity being absorbed by the wheat treated—about 1 gallon for each bushel treated. The quantity used can be replaced from time to time by adding a definite quantity of water, say 5 gallons (50 lb.), and a definite (weighed) quantity of bluestone, say 1 lb. All that is necessary is to pour the requisite quantity of water into the cask or trough some hours before it is required, and then suspend the weighed quantity of bluestone just below the surface of the liquid.

It is the practice of some farmers to replenish the liquid used by filling the cask or other vessel up to a certain mark with water and then adding a definite amount (say ½ lb. or ¾ lb.) of bluestone for every bag of seed treated. There is nothing seriously wrong with this method, but as each bag of grain does not absorb the same quantity of liquid, it has the disadvantage of not keeping the solution always of the same strength. Such a method has no advantage over the proper method, which is to add a definite amount of bluestone for every given quantity of water added. It is just as easy and far more accurate and satisfactory to add 1 lb. of bluestone for every 5 gallons of water, as to add ½ lb. of bluestone for every 4 bushels of grain treated.

The vessels used for holding the bluestone solution should **not be constructed of metal,** nor should metal be used in the construction of any vessel or implement likely to come in contact with the solution.

The Poisonous Effects of the Black Bean (*Castanospermum australe*) on Cattle.

S. T. D. SYMONS, M.R.C.V.S., Chief Inspector of Stock.

FROM time to time there have been reported from the North Coast district of New South Wales deaths amongst cattle as a result of eating the beans of the *Castanospermum australe* (Black Bean Tree, or Moreton Bay Chestnut), and Mr. Stock Inspector Devlin, of Casino, was asked to report fully should he be fortunate enough to obtain a typical case. He has now been able to obtain a suitable case for *post-mortem* examination, and has furnished the following interesting information:—

Report on a heifer which had contracted the habit of eating the bean of the *Castanospermum australe* (Black Bean, or Moreton Bay Chestnut)—commonly known as a "Bean-eater."

Description:—Red heifer, about 2½ years old.

Symptoms:—Body very emaciated, great debility; breathing, short and hard; head slightly drooped; eyes dull and staring; ears slightly drooped; coat hard, harsh, and dry; membranes of eyes, nostrils, mouth, and round anus and vulva very pale. There was a constant desire to micturate, the urine being dark and scanty; also diarrhœa, with a dark slimy discharge. The hair round the buttocks and tail had fallen out; round all four feet and from about 3 inches up from the fetlocks the hair had also fallen out. Round the top of the hoofs there was intense inflammation, with ulceration. In three out of four feet the hoofs appeared to be sloughing.

Post-mortem appearances:—The blood was pale and watery; slight peritonitis present; the rumen contained a large quantity of the bean, some pieces being up to 1 inch in diameter, with some grass. The reticulum also contained large quantities of the bean, but smaller in size. In the omasum the bean was not in such quantities, and the pieces of smaller size. The abomasum contained some smaller pieces of the bean, as also the pylorus and duodenum; but from there on through the intestines there was no sign of the bean, only a dark, slimy, thick, offensive fluid being present. There was inflammation all through the intestines, &c., it being more pronounced at the cæcum. In the abdominal cavity there were about 2 quarts of dark brown fluid.

The heart, lungs, liver, spleen, kidneys, and bladder, were pale, the last-named containing a very small quantity of urine.

A full description of this tree is given in "The Forest Flora of New South Wales," by Mr. J. H. Maiden, Director of the Botanic Gardens, Sydney, in an article which contains much valuable information, and, by permission, an illustration of the tree is reproduced herewith.

Amongst other points, he shows that the beans are extensively eaten by the natives of Brisbane River, and other parts of Queensland, but they are always first prepared by steeping them in water for some days, after which they are pounded into coarse meal. However, Bancroft states that the bean has deleterious properties as far as man is concerned, since if a small piece be eaten, it causes severe diarrhœa, with intense griping. Extended experience shows that very few stomachs can tolerate the beans. In 1883, Mr. Maiden

Black Bean (*Castanospermum australe*, A. Cunn.
Botanic Gardens, Sydney.

states, many cattle were lost on the Richmond River as a result of bean poisoning, the animals showing intense purgation; and yearly some mortality is attributed to this bean. It would appear that in some cases the seeds are rapidly fatal to pigs.

In the *Queensland Agricultural Journal* for October, 1901, is a report by Mr. J. C. Brunnich, who gives an exhaustive analysis, showing that, amongst

other constituents, the fresh bean contains 7·23 per cent. of a glucoside, "Saponin," to which he ascribes the toxic properties of the plant. Touching the consumption of the seeds by natives without injurious results, he mentions that as the "Saponin" is very soluble in water, soaking the crushed beans for a few days would remove the poisonous principle and leave a rather valuable food.

It is thus evident that in regard to cattle, and probably with other animals which acquire this habit, we have in the beans of the *Castanospermum australe* an intense gastro-intestinal irritant poison, causing severe diarrhœa. Treatment in such cases is not likely to be of much avail, but would consist in giving oleaginous purgatives such as large doses of linseed oil combined with opium, or chlorodyne, to allay the pain and prevent griping. Absolute prevention may, of course, be obtained by destroying the trees, or keeping stock away from them.

Any stock-owners who have had experience of this bean, and who might be able to supply further information as to its injurious effects, are asked to kindly furnish such information to the Stock Branch, Department of Agriculture.

Diarrhœa in Calves.

"J.B." writes asking for advice as to treatment of diarrhœa in calves, and as to the value of certain suggested remedies. If "J.B." will kindly furnish his address, full advice will be supplied to him by the Veterinary Officers of the Stock Branch. The reply to all his queries would be too lengthy for insertion in the *Gazette*.

Large Apples from Rylstone and Cessnock.

Mr. Thomas Gallimore, of Mount View, Cessnock, has forwarded to the Fruit Expert of the Department a specimen Lord Nelson apple, measuring 16½ inches, and weighing 23½ oz. Mr. Gallimore says it weighed 25 oz. when pulled. It speaks well for the possibilities of the Cessnock district as an apple-growing centre.

Since the receipt of the above, an apple of the same variety has been submitted from Rylstone, measuring 17½ inches in circumference and weighing 25½ oz. here.

Dry Farming.

Comparison of American and Australian Conditions.

DURING the past few years, considerable advance has been made in agriculture in the western portion of the United States of America, as statistics undoubtedly prove; and, apart from irrigation, greater returns from larger areas are being obtained by the practice of certain methods known as "Dry-farming." These methods would appear to vary in different localities, but the underlying principles are the same—mainly the conservation of moisture by means of cultivated fallows, cropping in alternate years, and the growth of varieties specially suited to the climate. A Dry-farming Congress has been in existence for about five years, and the reports of its annual sessions contain most optimistic accounts of results obtained and anticipated from the adoption of these methods.

At the Conference of Wheat-growers, organised by this Department in conjunction with the Farmers and Settlers' Association, and held at Sydney in July last year, Senator J. H. McColl, who attended two of these American Congresses, gave eulogistic accounts of the methods and results, and vigorously advocated the adoption of some of the "systems" here. It was clear, however, that the methods referred to consisted largely of good farming, such as is practised by numbers of progressive agriculturists in this and other Australian States, modified as required to meet varying conditions in different parts of the United States.

This aspect of the question cannot be too strongly impressed. The United States has extended its cultivated area and improved its average yields, just as Canada has done, because farmers have been ready to adopt the latest methods, and because scientific investigation has gone hand in hand with practical work; and the fact is an encouragement to us to continue our advance in both directions. But when we read of the phenomenal yields obtained by these practices in Western America—a region popularly supposed to resemble the interior of this State—we begin to wonder why it is that Booroomugga and Beloura* still carry sheep, and why the view from the Hungerford-road† should not embrace gleaming stretches of corn and lucerne instead of kangaroo grass and mulga and the mocking mirage.

A pamphlet just received from the United States Department of Agriculture gives us an opportunity to attempt some comparisons. It is Bulletin No. 188 of the Bureau of Plant Industry, "Dry-farming in relation to Rainfall and Evaporation," by Lyman J. Briggs, Physicist in Charge of Physical

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* Counties of Canbelego and Mouramba, Central-western New South Wales; rainfall, 16 and 15 inches respectively.

† On the North-western boundary of New South Wales; rainfall, 12 inches.

Investigations, and his Assistant, J. O. Belz. The pamphlet is prepared for the guidance of prospective settlers in regions of limited rainfall, and contains "a discussion of the relation of the quantity and character of the rainfall and of the evaporation to crop production under dry-farming methods in various sections of the Western States. Tables showing the normal rainfall for these States have also been compiled from the numerous publications of the Weather Bureau, and are appended for the convenience of prospective settlers." State rainfall maps are included, showing the distribution of the rainfall in each State. We have endeavoured, with the aid of this and other publications, to find those portions of the American dry-farming areas which most nearly correspond, in latitude, elevation, rainfall, and other respects, to the back country of New South Wales, and our readers may be interested in some of the results.

The 40th parallel of north latitude passes approximately through the centre of the United States from east to west. The corresponding parallel of south latitude passes through Bass Strait. The State of New South Wales is, therefore, much nearer the equator than the bulk of the dry-farming regions of America. The line 47 degrees north roughly bisects Washington, Montana, and North Dakota; the line 47 degrees south passes across the Southern Ocean some 300 miles below the southernmost point in Tasmania. Clearly, therefore, the conditions in these States are not comparable to those of Western New South Wales. Oregon, Idaho, Wyoming, and South Dakota, are also much further into the temperate zone than is our State, and it would be rather surprising to find that similar methods would produce exactly similar results, or that the same varieties of crops would thrive equally well. Moreover, the monthly distribution of the rainfall in these States is not at all like what we experience in New South Wales.

Nor is it fair to compare our conditions with those of the greater portion of Nevada, Northern Utah, North Colorado, North Kansas, or Nebraska, as these regions correspond in latitude with Tasmania. Apart from questions of rainfall distribution and elevation, these States enjoy a much milder summer than we do.

The southern half of New South Wales and the north-western districts of Victoria fall between the 32nd and 37th degrees of south latitude. The Western American States corresponding to this are Southern California, the southern point of Nevada, the bulk of Arizona, New Mexico, Oklahoma, and Texas. The only State which fairly corresponds in geographical position to the whole of New South Wales is Texas, lying between 26 degrees and 36½ degrees north latitude. New South Wales reaches from 29 to 37 degrees south. Southern Victoria has geographical counterparts in North California, Southern Nevada, Utah, Southern Colorado, and Southern Kansas.

It would seem, therefore, that in regard to geographical position the States which may reasonably be taken to correspond to Western New South Wales

and North-western Victoria are Southern California, Arizona, New Mexico, Oklahoma, and Texas; whilst States a little farther from the equator are Southern Nevada, Utah, Southern Colorado, and Southern Kansas. Of these, however, Colorado, Utah, Nevada, and New Mexico must be at once eliminated, as they vary in altitude from 3,000 to 14,000 feet above sea-level. The south-western portion of Kansas, which is comparatively dry, also exceeds 3,000 feet. We have no conditions like these in Western New South Wales. The altitude of Dubbo is 867 feet; Nyngan, 570 feet; Bourke, 350 feet; and Hay, 307 feet.

When we consider the monthly distribution of the rainfall we observe a great difference between our conditions and those of America. The Western American coast is a region of winter rainfall, the bulk of the rain occurring in the months October to March. For example, at Los Angeles, California, the total annual rainfall is about 13 inches; but of this, 11 inches fall during the winter and only 2 inches during the summer months. This is not a picked example, but just an average case shown on the charts given by Messrs. Briggs and Belz.

The Great Plains area, on the other hand, receives the bulk of the rain in the summer months. This is very pronounced in Kansas, where the records at Dodge show almost the exact opposite to those of Los Angeles; and little less so in Oklahoma. The latter State, however, is not at all dry, the rainfall varying from 18 to 45 inches, but most of the stations showing an annual precipitation of over 30 inches.

In the *Gazette* for January will be found Average Monthly Rainfall Tables for 107 stations in New South Wales. These have been compiled by the Commonwealth Meteorological Bureau from data taken as far back as the monthly records go. From an examination of these tables it will be seen that the rainfall in Western New South Wales is pretty evenly distributed throughout the year. In the northern portion, the wettest months are those of late summer (January, February, and March), due to the monsoonal disturbances; in the south the greatest precipitation is in winter and spring (June to October), the result of Antarctic disturbances. Typical examples are Nyngan, Bourke, and Moree in the north-west, and Wagga, Deniliquin, and Wentworth in the south-west. But nowhere is the preponderance of wet months as great as in the American examples quoted. On the basis of rainfall distribution the Great Plains area of the United States somewhat resembles our north-western districts, and the States towards the west coast are similar to Riverina and the south-west; but the comparison cannot be pressed closely.

Californian methods might thus be studied with advantage for the purpose of application in our south-western districts; always remembering that the winter rainfall is much more pronounced in the American State. California has an extraordinary variation in annual rainfall, ranging from 1 inch in Imperial County in the south-east corner to about 90 inches in the north-west; but the bulk of the State receives less than 20 inches rainfall, and the dry districts are certainly not more elevated than those of South-

western New South Wales. Maximum temperatures of upwards of 110 degrees F. are fairly numerous in the Californian reports.

The two States not yet dealt with are Arizona and Texas, and we will consider these in a little more detail.

The rainfall of Arizona varies from 3 inches in the south-west to 25 inches in the centre, fading off again to 6 inches in the north-east and south-east quarters. The north-east quarter reaches an elevation of 7,000 feet, and the south-east 5,000 feet; consequently these areas need not be considered. The south-western corner, the driest part of all, is less than 1,000 feet above sea-level (as low as 141 feet at one station). The rainfall at all the stations in this area for which figures are given is less than 10 inches, and the wettest months are those of late summer. The preponderance is a little greater than in North-western New South Wales, but the conditions are very similar. We should therefore be justified in looking for reports of dry-farming operations in the counties of Yuma, Maricopa, and in the lower parts of Pima and Mohave, in the State of Arizona, for comparison with our extreme north-west. Temperatures also support the similarity, as we find maximum readings of 119 degrees F. at Aztec, Yuma; 115 degrees F. at Gila Bend, Maricopa; 123 degrees F. in Pinal; and 119 degrees F. at Signal, Mohave.

Coming to Texas, we find rainfall varying from about 10 inches in the west to about 45 inches on the east coast, reaching 52 inches at one point. The rainfall is a little more pronounced in early autumn than ours, but still somewhat similar in distribution. The extreme west, however—the driest area—is as much as 5,000 feet above sea-level; and the rainfall increases as the elevation recedes towards the east. In the central-western portion of Texas, the rainfall varies from 20 to 25 inches, and the elevation is from 1,000 to 2,000 feet. It is not easy to find the portion of New South Wales which most nearly corresponds to this. In regard to rainfall distribution, the northern districts are fairly comparable, but those of a similar elevation have a slightly greater rainfall. Tamworth, 1,200 feet above sea-level, receives 27 inches; Boggabri, with 23 inches, has an elevation of only 800 feet. More southern stations, such as Dubbo and Wellington, receive a similar rainfall, but it is more evenly distributed. Still, looking at the matter broadly, this belt of Texas is fairly comparable to the northern portion of our main wheat belt, and we should derive benefit from a study of the methods adopted by Texan dry-farmers. Temperatures prevailing in the central-western portion of that State are also similar, maximum readings being 103 degrees F., 105 degrees F., and 109 degrees F. at different points, and only one station recording a maximum of 115 degrees F.

It is necessary to point out that this comparison is based upon meteorological grounds. No attempt is made to compare the soils of the dry-farming areas mentioned, and it is recognised that such a comparison might considerably modify these results.

"Black Oats."

GEO. L. SUTTON, Wheat Experimentalist.

It is now recognised that it is difficult, if not impossible, to destroy the vitality of "black oat" seed that is in the ground. As far as is possible, it is therefore advisable to use every precaution to ensure that it is not knowingly introduced to ground that is free from it. A farmer cannot prevent its introduction by wind or other natural means, but he can prevent its introduction with the seed wheat when it is sown. There are now on the market some machines of the grader type, which effectually separate the "black oat" from wheat with which it may be mixed, and wheat grain which has "black oats" mixed with it should be passed through one of these machines before it is used for seed. To omit doing so is obviously an extremely bad practice.

Though it is so *difficult* to destroy the *seed* of the "black oat," it is *easy* to destroy the "black oat" *plant*. The foundation of all successful methods of dealing with this pest must therefore consist in affording the seed that is in the ground, or that may get into the ground, an opportunity of germinating, and then destroying the resulting plants before they mature and form fresh seed.

Cultivation will destroy the "oat" plants, but it will not destroy the oat seed, nor will it cause it to germinate so that subsequent cultivation may destroy the plants. The "black oat," in common with other seeds, requires moisture for its germination. A recognition of these facts will make it clear why last season, because of the dry summer and autumn, thorough cultivation in some cases failed to eradicate, or even reduce, the pest, though in previous years success had attended similar operations.

The seasonal conditions prevailing during the summer and autumn of last season did not encourage germination. They therefore tended to the spread of the "oat," and in consequence it was abundant in the recent harvest. The general rains which have lately fallen are favourable for germination, and will prove extremely beneficial as an aid to check and eradicate the "oat" pest. In consequence, with reasonable treatment, it should be either entirely absent next season, or, at any rate, less troublesome than it was last year. These rains will cause the seed near the surface to germinate, and timely cultivation with the plough or other implement will destroy the resulting plants, thus freeing the soil in which they were growing from the pest.

It is now recognised that only seeds that are near the surface will germinate, and that those that are buried more deeply do not rot, but lie dormant for a lengthy period of unknown duration. The destruction of the plants by cultivation has therefore not eradicated the "oat" seed from the whole of the cultivated soil, but only from the portion near the surface.

If the plough has been used—as it should be on stubble land which is to be cropped again with wheat this year—a fresh supply of vigorous oat seeds will have been brought near the surface by the inversion of the soil. These seeds are full of vitality, and will grow at once if the soil be moist; or if dry, after the first useful fall of rain. If a wheat crop free from "oat" is to be obtained, these seeds must be given an opportunity to grow, and the resulting plants destroyed by shallow cultivation, before the wheat seed is sown.

As ploughing will bring to the surface seeds which have been lying dormant possibly for years, but which have retained all their vitality, each ploughing is likely to be the cause of the surface soil being reinfested, even though it has successfully destroyed the oat plants growing on the surface, and was performed with that object in view. It is therefore undesirable to plough "oaty" land immediately before planting wheat, and on such land the ploughing should always be followed by shallow cultivation, to destroy any oat plants that may be present, after the oat seeds, brought to the surface by the deep cultivation of ploughing, have had an opportunity to germinate. For the same reason, allowing the paddocks to go out of cultivation will not eradicate this pest, unless the period be an extremely long one. Because of the very vigorous character of the seed, which retains its vitality after lying buried in the soil for years, the pest will appear (perhaps slightly lessened) when the paddocks are again brought into cultivation.

Shallow cultivation may be given immediately prior to planting, because it destroys the plants in the surface soil, and does not bring near the surface the dormant seeds in the deeper portions of the soil.

As the only practical and effectual means of cleaning infested ground of the pest is by getting the seeds to germinate and then killing the plants, success will only be assured when ample time is given for the seeds in the surface soil to germinate. This can be profitably done by growing a fodder crop, say rape, oats, peas, or barley, between two wheat crops. When this is done, the oat seed has a whole season to germinate. It is unlikely that during that time there will not be some period during which favourable conditions for germination exist. As the fodder crop is grazed, the "oat" plants are kept from forming seed, and are finally destroyed when the residues of the fodder crops are ploughed in.

Though cultivation will not destroy the seeds, nor cause them to germinate, under some conditions it may be made to assist in their germination. Breaking down the ploughed land to make it less rough, or cultivating dry compact land to make it loose, will aid in their germination, by enabling the most to be made of light showers that fall.

To eradicate the "black oat" from, or reduce it in next season's crop, the following recommendations are made:—On land that is being fallowed, the weeds should be kept down by stock, and should eventually be killed by thorough cultivation or skim-ploughing. On land that is known to be "oaty," the plantings should be delayed, and the cultivation continued, until it is as late as is safe to plant for best results. The ground should **not** be re-ploughed immediately before planting. To plough just before wheat is planted is a

mistake often made when dealing with this pest. This procedure, though performed with the object of doing what is right and proper, very often undoes the good work of cultivating and cleaning the fallow. Many seeds which have been lying dormant, because they were buried too deeply to germinate, are, by ploughing, brought to the surface; and under conditions favourable for germination, which must be present for the wheat to germinate, they grow at the same time as the wheat. In consequence the resulting wheat crop is "oaty."

Ground that was cropped last year, and which is to be again cropped this year, should be ploughed and broken down as soon as possible, so as to encourage the weed seeds to grow. It should be then treated according to the plan recommended for fallowed land.

The effect of cultivating the fallowed, or stubble land, prior to sowing will be not only to clean the land, but also to increase the yield of the succeeding crop of wheat. Farmers need not hesitate to work their fallows, fearing it will not pay. Results conclusively show that it is better to plant late on well prepared land than early on land badly prepared.

When facilities or opportunities do not exist for cleaning the ground before the crop is sown, the pest may be reduced, if not eradicated, by sowing, early, a quickly maturing variety of wheat, and making either hay or silage of the crop. Varieties like Firbank, Florence, Comeback, and Bunyip are excellent for this purpose. If planted early they will be ready for hay or silage before the "black oat" matures and sheds its seed, and can be dealt with before the main harvest commences.

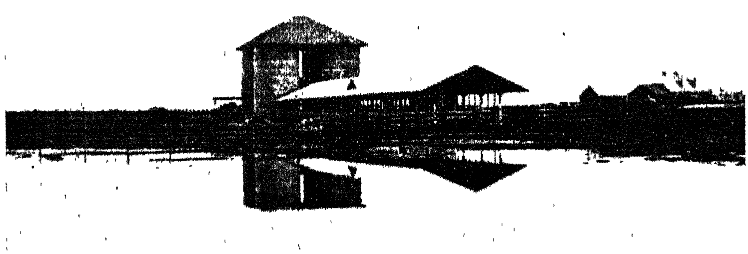
Those who mean to keep the "oat" pest in check should:—

Use only wheat seed that is free from "black oats."

Allow the "oat" seed that is in the ground an opportunity to germinate.

Assist it to germinate before the wheat is sown, by breaking down the ploughed land and by cultivating compact soil.

Kill the "oat" plants by cultivation.



Insectivorous Birds of New South Wales.

[Continued from page 38.]

13. Diamond Bird.

THIS pretty little insect-eater is selected as a type of the Pardalotes, or spotted birds, a genus peculiar to Australia and Tasmania. The particular species illustrated, the "Spotted Pardalote," or "Diamond Bird," is the most familiar, its main habitat being the south-eastern portion of New South Wales. The picture shows the birds reduced to half their natural size.

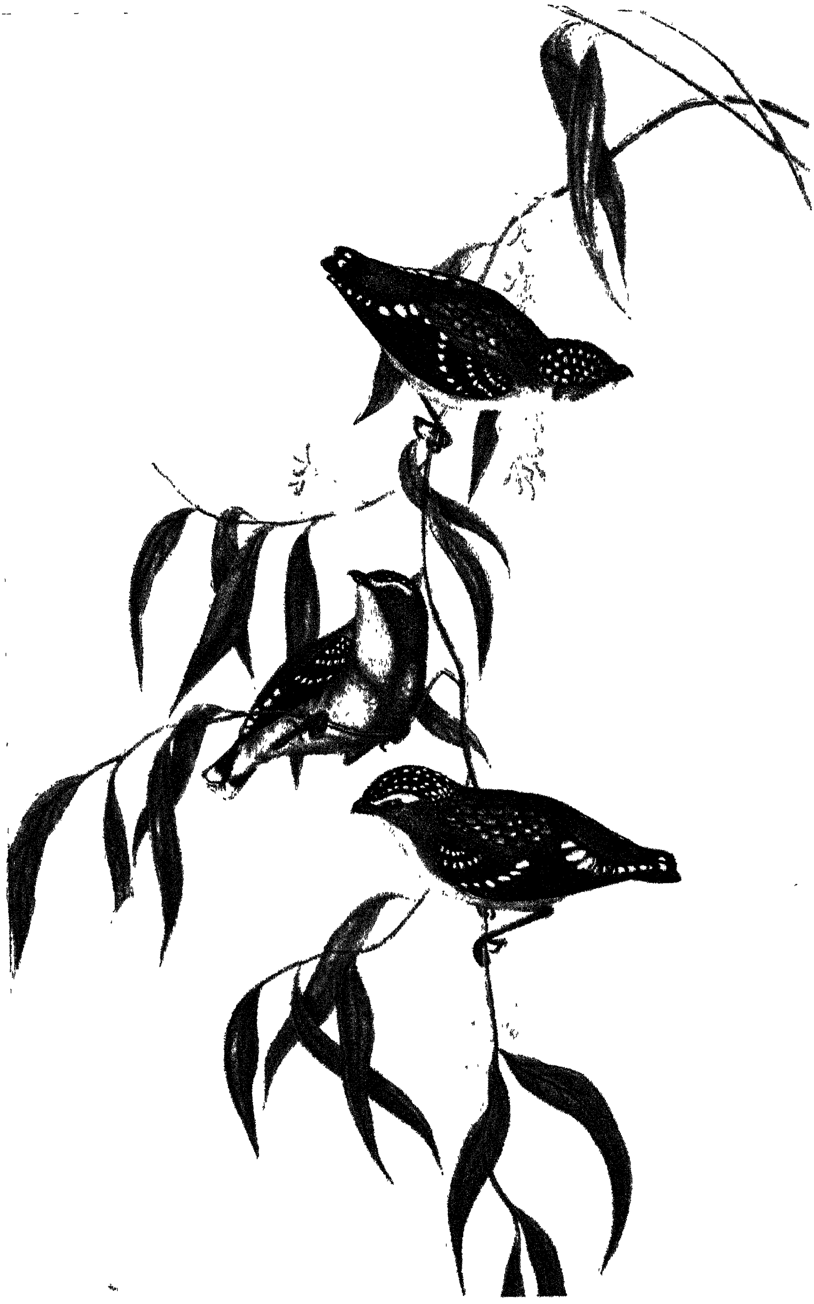
In appearance, the pardalotes are distinct from any other birds commonly met with in Australia. This one, the Diamond Bird, has such variegated and beautiful plumage that it is difficult to describe it. The white and yellow patches near the tips of the feathers give the spots which distinguish the pardalotes, the Diamond Bird being the most typically spotted of the group.

Another peculiarity about the pardalotes is their nesting habit. Instead of constructing a cup-shaped nest on the limb or in the fork of a tree, the Spotted Pardalote burrows a hole in a creek bank, or other suitable earth, from 1 to 3 feet in depth, and at the end excavates a chamber of sufficient size to receive the nest; hence the birds are sometimes known as "Bankers." The nest is dome-shaped, and is constructed mainly of soft strips of the inner bark of gum trees, which the birds laboriously gather in their bills and weave into the nest in the dark. The entrance is merely a hole in the ground, about an inch and a quarter in diameter, which, so far as outward appearance goes, may have been made by any one of a dozen small animals. Other pardalotes also nest in banks, but the Red-tipped and Yellow-tipped species, which are common throughout New South Wales, nest in hollow trees; while the Striped Pardalope sometimes builds in the nest of the Fairy Martin.

Four or five pure white eggs are laid.

The Diamond Bird is more common in the coastal than in the inland districts. It is a creek-loving bird, and searches for insects along the banks or in the neighbourhood of streams. It is exclusively insectivorous, and stomachs examined by Mr. North contained only the remains of small insects. A specimen obtained by Dr. J. Burton Cleland, on the Hawkesbury River, was found to contain thrips, beetle remains, and floating scales, probably of aphis; whilst another from the same locality yielded material which suggested that the bird had been feeding upon cutworm moths or aphis. Mr. Lancelot Harrison says:—

> In winter this bird feeds low down in the gum saplings, and I have frequently watched it at work in the outer leaves. The bulk of its food is, as far as I can make out, the scale insects found on the leaves, and the saccharine exudations that they cause. While feeding in this manner, attention is often drawn to it by the clicking sound as it bites on the margins of the leaves.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"DIAMOND BIRD."

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"CRESTED SHRIKE TIT."

This should be quite sufficient evidence of the value of the little family of pardalotes. They are usually somewhat shy and retiring, but more fearless when building. The common call is a double, followed by a treble whistle, all on the same note, thus:—"Phee phee—phee phi-phee." When sitting still a characteristic call is a high and a low note, like "Sweet Dick." When heard in the trees it is rather difficult to locate, and one is sometimes surprised to find upon investigation that an apparently far-off call comes from a bird quite close at hand.

14. Crested Shrike Tit.

The next plate shows a bird which is nowhere very numerous, but which will resist the destructive efforts of the egg-collecting boy until the aeroplane becomes the ordinary method of locomotion in the bush, as it prefers the fork of the topmost twigs of a tall eucalypt or apple-tree to build its nest, which is deep, and narrower at the top than at the bottom, so that the eggs cannot roll out even when the branches on which it is built sway horizontally in the wind. There the Crested Shrike Tit lives and works, and to quote Mr. Hall, "keeps in subjection that portion of coleopterous life which is not sought for by most other birds who frequent the lower branches." The bird is, therefore, another outpost in the little army which fights for the farmer. Its home is the upper limit of vegetable life, where our tall native timbers meet the sky. It is exclusively insectivorous, and Mr. North has found nothing in the stomachs of these birds but the remains of insects and their larvæ.

In this plate also the birds shown are half natural size.

The Shrike Tit, with his black crest and yellow under surface, is a surprisingly active and animated little creature. He grasps his prey in one claw, and rends it to pieces in a manner strongly suggestive of the rapacious falcon, hence the name *Falcunculus* (Little Falcon). His powerful bill is of great assistance to him. With it he scrapes away the bark around the spot where his wife is to build her nest; he clips the branchlets off above the nest, apparently to let plenty of sunshine into his little home; and while his mate lays two or three white, brown-spotted eggs, and rears her little nestlings in the pure upper air of the forest, he climbs in and out of the branches, obtaining his food at all levels, and few insects escape from the grip of that sturdy bill. He will also visit orchards and gardens in search of beetles, caterpillars, or other insects, which are enemies of the agriculturist, but very welcome as food for the little ones on high. The Shrike Tit is not at all a shy bird, and will proceed with his animated search for food within a few feet of the onlooker.

We would, therefore, urge our readers to regard this little black and yellow bird as a friend. He is not very numerous anywhere; perhaps the County of Cumberland has as many pairs as any part of the State. Permit them to nest and live in the tree-tops; otherwise, to counteract their beneficial effects upon the rainfall, our tall forests may become the breeding-grounds for pests which would descend and work havoc in our orchards and fields.

Yanco Experiment Farm.

HARVEST 1910.

F. G. CHOMLEY, Manager.

THE cereal crops this season at Yanco Experiment Farm were all grown for hay-making, to supply feed for farm stock primarily, and a limited quantity above farm requirements for sale and transfer to other places. As irrigation is practised, the character of the season, more particularly at sowing time, when a dry spell is likely to occur in this district, is not a serious question; although a good growing season benefits irrigated as well as non-irrigated crops.

All our cereals grown on the demonstration area were subject to the same treatment—that is, the land was first ploughed and harrowed, a few patches of lumpy ground were rolled, then small furrows were run by means of a two-horse spring-tooth cultivator, from which the ordinary tines had been removed, and a wooden beam, 6 feet long, carrying two shovel tines attached to the two spring tines, set 5 feet apart. These furrows ran in the direction of the fall. The land was then irrigated somewhat late, owing to a difficulty in the temporary water supply. The method adopted enabled the land to be thoroughly soaked without flooding the surface.

It would have been better to have got the irrigating done earlier in the season. A start was made to apply water on 27th April, and watering was continued to 3rd May. This was not the intention, but owing to the supply failing in the billabong from which the water is pumped, a second pump and engine had to be installed, and water obtained from Cudgell Creek in two lifts. Had water been available it would have been better to have irrigated some patches which were very hard, before ploughing, when it would have broken up very well instead of in clods, which gave a lot of trouble. In leaving the irrigating so late a risk of autumn rains delaying the work is run; for when the surface and subsoil are saturated rain cannot soak in, and consequently lies in pools, or runs down the slope, cutting channels and washing the surface soil away. Moreover, if the ground is irrigated while warm and seed got in early, good root growth is made before winter, and a fair amount of feed is available for feeding off if required.

The water supply for the Farm is still derived by pumping from a temporary source, and it was rather a difficult matter with our temporary channels to keep the supply going for the orchard and lucerne. Therefore, no crops were given a second watering—a practice of doubtful advantage in normal years. Certainly, a greater weight of fodder is obtainable, but it is questionable if the quality of the hay is not materially lessened—the growth is coarser, and it is alleged by American investigators to be of inferior feeding value and less palatable. This is a matter which could be tested with advantage in this State, and will form an important part of the work on this Farm as soon as the Northern Murrumbidgee Canal is ready to deliver water by gravitation, and suitable experiments are devised to that end.

When the ground was dry enough on the surface, a double-disc harrow was run over the land and also the spring-tooth cultivator, and, finally, one stroke was given with the ordinary harrows. Immediately after this the seed was sown with a drill, and the land again furrowed out with the cultivator with two tines, as above described. This was for the purpose of a second irrigation, should the season be so bad as to require it. Fortunately, this was not necessary. The seed sprouted well and was soon up sufficiently to shelter the ground from the wind.

In connection with drilling in seed on land which has been irrigated, it should be noted that a disc drill was used. This class of drill is very unsatisfactory on damp soil. The discs fill with soil, and, instead of working as discs should, they drag and do not cover the seed properly. A hoe or shoe drill would be preferable.

The whole of the crops were cut with a binder, the sheaves being as small as our machine will tie, and stooked as soon as cut in round stooks of about 12 sheaves. The colour of the hay is very bright, and the straw fine. It is expected that the sample of chaff which this season's hay will make will be equal to that of last season.

During the growing period the following falls of rain were recorded. The rain previous to irrigating is, of course, under our conditions, of no account:—

RAINFALL, 1910.

May.		June.		July.		August.		September.		October.		November.	
Date.	Points.	Date	Points.	Date.	Points.	Date.	Points.	Date.	Points	Date.	Points.	Date.	Points.
...	...	12	6	2	7	1	3	4	76	1	1	4	54
...	...	13	½	5	3	5	4	9	9	2	5	7	18
...	...	19	29	6	0	19	6	11	15	5	6	12	36†
...	...	20	10	8	9	31	59	16	7	6	5*	...	
...	...	21	4	9	18	...	...	17	9	10	0	...	...
...	...	22	30	11	17	...	...	27	7½	11	11	.	...
...	...	23	21	12	1	...	..	28	1	18	16	...	...
...	...	24	4	13	0	...	...	29	20	19	1	...	...
...	...	25	0	14	12	...	...	..	...	25	1	...	..
17	47	27	0	15	1	...	...	...	...	26	0	...	...
18	1	28	6	21	29	...	...	...	...	29	47	...	...
24	11	29	133	29	10	..	...	...	...	30	2	..	...
26	3½	30	6		..	...	...	...	..	...	.	...	..
...	62½	...	244½	...	107	...	72	..	144½	...	95	...	108

* Wheat and barley crops received 647½ points; † oats, 833½ points.

The Skinless barley and wheats, which were the first to be fit for cutting, received 647½ points of rain; the oats, which were more backward and were allowed to form grain, received 833½ points. Much of the rain fell in such slight showers that, although recorded by the rain gauge and swelling the total precipitation, they were really of little benefit to the crops, and in many instances did not reach the soil at all.

Crops at Yanco Experiment Farm, 1910.

Crop.	Variety.	Area.	Culture	Fertiliser.	Rate of Seeding.	Previous Crop, &c. 1909.	Yield per acre—1910. (Computed.) tons	cwt.	Notes.	Date of Cutting.
		acres.			lb. per acre.		tons	cwt.		
Wheat for hay ...	Comeback ...	2·46	Ploughed; harrowed; irrigated; cultivated; drilled.	Superphosphate, 60 lb. per acre.	45	Skinless barley, not irrigated.	2	9	Hay fine and clean	10 Oct.
,, ,, ..	Plover	2·33	,, ...	,, ...	,,	Malting barley, not irrigated.	1	17	Very backward ..	19 ,,
,, ,, ...	Marshall's No. 3	0·91	,, ...	,, ...	,,	Wheat irrigated.	2	11	Thick stalk, stronglong head.	19 ,,
,, ,, ...	John Brown ...	2·21	,, ...	,, ...	,,	,, ...	1	17	All headlands to White Lammas and Zealand.	13 ,,
,, ,, ...	White Lammas	5·0	,, ...	,, ...	,,	,, ...	2	13	Carried a lot of trash and dead flag.	20 ,,
,, ,, ...	Zealand ...	4·74	,, ...	,, ...	,,	,, ..	2	13	Best hay wheat tried.	22 ,,
Barley	Skinless ...	3·16	,, ...	,, ...	40	Wheat, not irrigated.	2	7	Weak in straw, liable to lodge; very sweet hay, relished by stock.	11 ,,
Oats	Abundance ...	3·5	,, ...	,, ..	36	,, ...	3	1	Smutted; not pickled.	18 Nov.
,, ...	White Horse ...	1·8	,, ...	,, ...	36	,, ...	2	7	,, ,,	19 ,,

. The yields as shown in the table are comparable, as the same method of computing has been employed in all cases; but they are not weighbridge weights. The yield of Plover this season was far below last season; it did not come away strongly at first, and never grew like it did in the previous year. The fact that it was pickled in bluestone and salt this season and was not pickled the previous year may account for the difference. However, all the other wheats were pickled this year and they did about as well, considering the season, as previously.

ON A NEW GENUS OF AUSTRALIAN INSECTIVOROUS BIRDS.

ALFRED J. NORTH, C.M.B.O.U., C.M.Z.S., Ornithologist to the Australian Museum, Sydney.

In December, 1910, Mr. Edwin Ashby, of "Wittunga," Blackwood, South Australia, wrote to my private address and asked me to examine a skin of a bird he had sent to the Curator of the Australian Museum, and to pass an opinion on it. This I did, replying, "A new bird, possibly allied to *Ephthianura.*" Early in February, 1911, I received from Mr. Ashby, a printed "Description of a new *Ephthianura*" (in galley form), in which he had described the specimen in question, under the name of *Ephthianura lovensis,* thus associating it with the name of its discoverer, Mr. J. R. B. Love; but there is nothing in the description to indicate whether it is a reprint from any publication.

Mr. Ashby hesitatingly referred it to the genus *Ephthianura,* and states it "may, after further investigation, exhibit generic differences." I beg to state emphatically that it is not an *Ephthianura,* and I have much pleasure in substituting for it, the generic distinction of *Ashbyia,* thereby connecting with it the name of Mr. Edwin Ashby, who for a number of years past has been doing good work in Australian Ornithology.

Order :—PASSERES.

Family :—Timeliidæ.

Sub-Family :—Timeliinæ.

ASHBYIA, *gen. nov.*

Generic characters :—Like *Ephthianura,* to which it is possibly allied, but it is easily distinguished from that genus by its larger and more robust bill, especially at the base, and its longer and more pointed wings.

Type :—*Ephthianura lovensis,* Ashby. *Habitat* :—Leigh's Creek, South Australia.

The termination used by Mr. Ashby in the specific name in describing this species, is, by the rules of zoological nomenclature, used only for naming a species after a locality or country; the correct scientific designation for this bird is *Ashbyia lovei.*

Fumigation.

W. J. ALLEN.

Owing to the great diversity of opinion which has existed as to the efficiency of the several solutions recommended and used for spraying trees, and the necessity, even after a satisfactory spray had been found, of repeating the operation so often in a short period of time, a large number of our citrus growers have abandoned this method of fighting scales of different sorts and have substituted fumigation, with, I am pleased to say, in nine cases out of ten, highly satisfactory results. There have been some, as there always are in every experiment of the kind, who have not been so successful, and therefore condemn unhesitatingly, while the chances are the fault has been with themselves, either in fumigating at the wrong time or in not excercising due precautions in the carrying out of the work.

Among some of the causes of failure which have come under my notice and which, wherever it has been possible, I have made a point of finding out, are:—First—under-estimating the size of the tree; second—fumigating at the wrong time; third—neglect to see that the tents were free from holes; fourth—carelessness in weighing the cyanide; and fifth—an insufficient quantity of sulphuric acid to dissolve the cyanide.

This treatment, like any other, requires to be carried out carefully and systematically, and there must be no trusting to guesswork, or it cannot be expected that the operator will be as successful as his more careful neighbour who, by the exercise of a little patience and discretion, without any apparent trouble, rids his trees and fruit, not only of scales, but of the black and disfiguring smut.

Since the publication of the results of the experiments which I carried out in the Glenorie district some ten years ago, and which gave such excellent results, many growers have adopted this method, and it is no uncommon sight, in driving through our fruit-growing districts at the proper time, to see trees covered by tents in many of the orchards, and of the number of growers following this method many are doing the work regularly every year; so much so, indeed, that the process is now long past the experiment stage, as a number of our largest and most up-to-date growers have been fumigating for a good number of years. It is very gratifying to me to find that many of those whom it was most difficult to induce to try this method are now the most enthusiastic in its praise as being the best means of helping them to keep their orchards clean. In addition to the number of opinions attached to my previons report, dozens of others have written me acknowledging the beneficial results following on this treatment, particular stress being laid

on the fact of the luxuriance of the growth after cyaniding, the glossy, rich appearance of the leaves, and the improvement in the quality of the fruit, which is larger, smooth, and thinner-skinned, and in every respect a better commercial article than could ever be produced from scale-infested trees.

Thanks to fumigation, there are to-day in this State thousands of cases of both oranges and lemons which can find an entry into any State in the Commonwealth, and with which no inspector can find room for complaint.

With reference to those cases where fumigation has not proved entirely satisfactory, owing, as I said before, to *under-estimating the size of the tree*, I might say that in measuring the tree it is necessary to get the extreme height and width, as if this is not done, and in consequence a smaller charge applied than the tree should really have, the scales may not all be killed, as in my original table I have given the very least quantities which will suffice to clean the tree.

It is easy to ascertain the size of the tree by using a pole with, at intervals of every foot, a distinct mark printed or cut in it, so that all the operator has to do is to hold it up to the tree and find out the extreme height and width; then by referring to the table the quantity of chemicals required can be found opposite the figures corresponding with the size of the tree.

2nd. *Time for Fumigating.*—While fumigating can be carried out almost any time of the year, best results are obtained by fumigating in the latter part of January or February, and the work is best carried out at night. At that period of the year most of the scales are young and tender soon after hatching and are least protected, and in order to rid the tree of all insects of this kind with one treatment, the work is best performed in the months mentioned. In fact, as regards the Indian Wax Scale, this is the only period of the year when they can be successfully treated, as later, when well protected by the waxy covering, it cannot readily be destroyed. Also, in the case of the Brown Scale, or what is (erroneously) commonly known throughout the Cumberland district as the Black Bug, when the scales are old and only eggs found under the shell it is much more difficult to clear the tree than when the young insect is just hatched.

By treating the trees at this time of the year nearly all the scales are destroyed, and the few that may be left will have little time to breed before the cold weather sets in, and, in consequence, the few that may hatch cannot spread over many of the oranges.

Another reason in its favour is that the fruit is still growing and expanding, and, while in this stage, the dead scale will come off before the fruit ripens. If, on the other hand, the trees are treated when the fruit is ripe, the scale, while it may be killed, will adhere to the fruit and will be found very difficult to remove, even with a brush.

If the trees are treated early in the spring the chances are that, should a few scale be missed, by the autumn these few have multiplied and spread over a considerable portion of the tree and fruit, and will spoil the latter for export purposes.

The work, as I said before, is best done at night, as there is less danger of harming the tree, even if the charge is a little heavier than it should be. If this were done in the daytime, or even the ordinary charge used if the day were hot, many of the leaves might be removed and some of the small twigs burnt. Therefore, as far as possible, do the work at night, late in the evening, early in the morning, or on cool, cloudy days, but never, by any chance, during the heat of the day.

Lemon and mandarin trees, it is found, stand the fumigation much better than the orange—that is, taking two trees of equal size and treating them with the same charge; while the mandarin would not show any ill-effect, the orange-tree would lose a few of its leaves. I would, therefore, recommend always treating the latter at night, or on cool and dull days. The night treatment appears to be the best, however, as a charge which would in the daytime remove leaves, and perhaps burn a little of the tender part of the twigs, would have no detrimental effect where the work was performed at night. I think that lemon and mandarin trees can be treated with very good results during the daytime, except on very hot days, when I would not recommend continuing the work.

3rd. *Holes in the Tents.*—Always see that the tents are patched and free from holes before starting to fumigate, otherwise the holes provide an escape for the fumes, and the work is not done properly.

4th. *Care in weighing the Cyanide and Sulphuric Acid.*—Great care must be taken to have the chemicals accurately measured out. I have seen some operators at work who exercised care in weighing out the cyanide and measuring the sulphuric acid (which latter is, of course, liquid measure), and yet the cyanide was not dissolved. The trouble in this case is that the sulphuric acid was not up to strength. In such cases a greater quantity of the acid must be added until sufficient is given, so that upon emptying the generator it is found that the cyanide is throughly dissolved.

On the other hand, I have heard of certain growers who have dispensed altogether with the use of the scale and measuring glass, and simply guess at the quantities required. Is it any wonder, therefore, that we read of a tree being killed occasionally; or that with those who will not exercise the precautions impressed upon them, fumigation has turned out unsuccessful?

If sufficient cyanide, sulphuric acid, and water are put in the generator and placed under an air-tight tent, the scale insects on the trees so covered are bound to be killed; they cannot escape, unless perhaps an odd one which may be protected by a fold of the tent, or between a few leaves which may be pressed together by the weight of the tent.

The water is first poured in the basin or generator, then the sulphuric acid added slowly, and the generator placed well under the tree and away from the tent, so that when the cyanide is dropped gently into the vessel there may be no danger of the contents splashing on to the tent.

When the tent is over the tree, and the sides, with the exception of one place, are held down by earth, put in the vessel containing the water and

sulphuric acid, well under the tree, and then by inserting the arm through the loose part of the tent and holding the material close, drop in the cyanide and withdraw the arm, throwing some earth on the loose canvas to hold it down.

Time.—The trees should be allowed to remain covered for forty-five minutes, as it has been found that in that time all scales are killed, and the work is beyond doubt properly done.

Fumigation Tables.—For ordinary purposes the original table (No. 1) as published in my previous pamphlet on fumigating experiments, will be found of sufficient strength where the trees are infested with Red Scale only, but where the trees are badly infested with Red and Brown Scale, White Louse, &c., I would recommend following the revised table (No. 2), which shows an increase in the strength of the charge of one-eighth, and which should clean the worst trees; but the latter strength should never be used except at night time, and under no circumstances on a hot day.

When large quantities are used, it is best to divide the charge, using two generators in place of one, and place either a board or tin over the generator and a few inches above it, so as to spread the fumes which might otherwise prove too strong for the leaves and twigs immediately above them, some of which might be burnt. As a matter of fact, it will be found advantageous to place this board or covering over the generator at all times, as it helps to spread the fumes.

The tables are arranged so that the *diameters* of the trees are in numerical order.

Deciduous Trees.

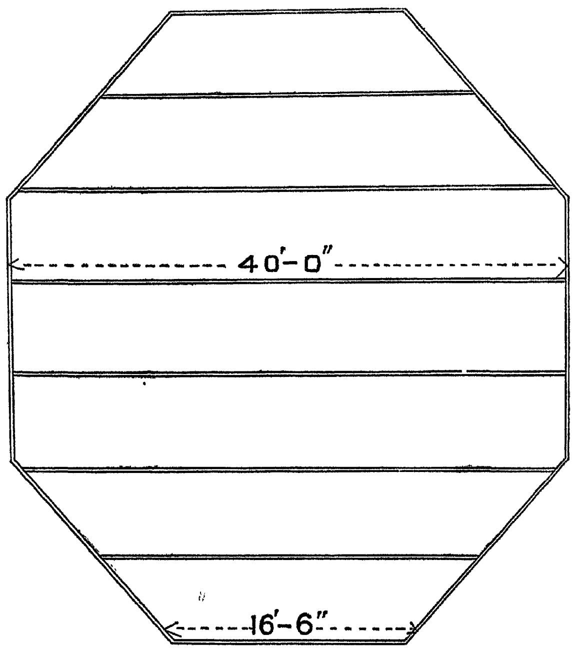
For fumigating deciduous trees for San José and other scales in the winter while the trees are dormant, the charge may be increased by one-third.

Fumigating Tents.—These can be either in the form of sheets, circular tents, or box-tents, according to the size of the trees to be covered. One of the objections raised in the early part of the history of fumigation was the cost of materials for making the tents; and although at one time this threatened to be a serious drawback, yet now it has been shown that a cheaper material will answer the purpose quite as well, and the outlay is more than covered by the increase in the prices obtained for the clean fruit.

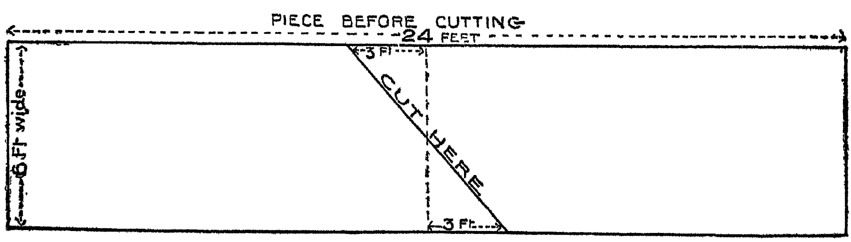
The leading chemist and druggist stores in Sydney stock cyanide of potassium and sulphuric acid. The prices at present quoted by Messrs. Elliott Brothers, O'Connell-street, are as follow:—Cyanide of potassium, 2-cwt. lots, 9d. per lb.; 1-cwt. lots, 9½d. per lb.; 56-lb. lots, 10d. per lb.; 28-lb. lots, 11d. per lb.; sulphuric acid, in 40-lb. jars, costs 1½d. per lb. Measuring glass and generating vessels are kept in stock; prices on application.

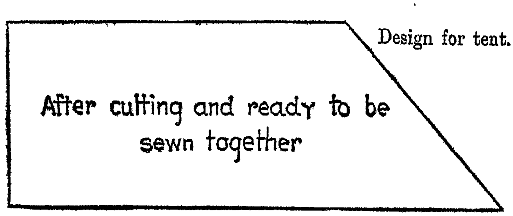
For small trees, from 3 to 6 feet high, the box-tent made of calico or even strong paper, tacked over a frame, will do, being light, cheap, and easily handled, and the charge once ascertained would be the same for all trees treated with any one box.

Circular tents, made as per instructions given, are found most economical for trees from 6 to 11 feet high, but for trees of larger size sheets are the more quickly and easily handled, although more costly than tents.



Octagonal sheet for fumigating large trees. Size as indicated. Seams 2 inches wide around outer edges and at junction of strips of material. To make a sheet of this size will require 78 yards of sheeting 6 feet wide.





Design for tent.

CAUTION.—On no account should trees be fumigated for at least six months after they have been sprayed with Bordeaux Mixture. If it is necessary to spray with this mixture, an application may be made within a few days after fumigating.

No. 1 Table.

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz.av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz.av.	fl. oz.	fl. oz.
4	3	25	$\frac{1}{3}$	$\frac{1}{2}$	1	11	11	941	$4\frac{3}{4}$	5	14
4	4	45	$\frac{1}{2}$	$\frac{1}{2}$	2	12	11	1,026	$5\frac{1}{4}$	6	16
5	4	57	$\frac{1}{2}$	$\frac{1}{2}$	2	13	11	1,112	$5\frac{3}{4}$	6	17
6	4	68	$\frac{3}{4}$	1	2	14	11	1,197	6	6	18
7	4	79	$\frac{3}{4}$	1	2	15	11	1,283	$6\frac{1}{2}$	7	19
4	5	71	$\frac{3}{4}$	1	2	16	11	1,368	7	7	21
5	5	88	$\frac{3}{4}$	1	2	6	12	611	$3\frac{1}{4}$	4	10
6	5	106	$\frac{3}{4}$	1	2	7	12	713	$3\frac{2}{3}$	4	11
7	5	124	1	1	3	8	12	814	$4\frac{1}{4}$	5	13
8	5	141	1	1	3	9	12	916	$4\frac{3}{4}$	5	14
4	6	102	$\frac{3}{4}$	1	2	10	12	1,018	$5\frac{1}{4}$	6	16
5	6	127	1	1	3	11	12	1,120	$5\frac{2}{3}$	6	17
6	6	153	1	1	3	12	12	1,221	$6\frac{1}{4}$	7	19
7	6	178	1	1	3	13	12	1,323	$6\frac{3}{4}$	7	20
8	6	204	1	1	3	14	12	1,425	$7\frac{1}{4}$	8	22
9	6	229	$1\frac{1}{4}$	2	4	15	12	1,527	$7\frac{3}{4}$	8	23
4	7	139	1	1	3	16	12	1,629	$8\frac{1}{4}$	9	25
5	7	173	1	1	3	17	12	1,730	$8\frac{3}{4}$	9	26
6	7	208	$1\frac{1}{4}$	2	4	18	12	1,832	$9\frac{1}{4}$	10	28
7	7	242	$1\frac{1}{4}$	2	4	19	12	1,934	$9\frac{3}{4}$	10	29
8	7	277	$1\frac{1}{2}$	2	4	20	12	2,036	$10\frac{1}{4}$	11	31
9	7	312	$1\frac{3}{4}$	2	5	7	13	836	$4\frac{1}{4}$	5	13
10	7	346	$1\frac{3}{4}$	2	5	8	13	956	$4\frac{3}{4}$	5	14
6	8	271	$1\frac{1}{2}$	2	4	9	13	1,075	$5\frac{1}{2}$	6	16
7	8	317	$1\frac{3}{4}$	2	5	10	13	1,195	6	6	18
8	8	362	$1\frac{3}{4}$	2	5	11	13	1,314	$6\frac{2}{3}$	7	20
9	8	407	2	2	6	12	13	1,433	$7\frac{1}{4}$	8	22
10	8	452	$2\frac{1}{3}$	3	7	13	13	1,553	$7\frac{3}{4}$	8	23
11	8	498	$2\frac{1}{2}$	3	7	14	13	1,672	$8\frac{1}{2}$	9	25
12	8	543	$2\frac{3}{4}$	3	8	15	13	1,792	9	9	27
6	9	344	$1\frac{3}{4}$	2	5	16	13	1,911	$9\frac{2}{3}$	10	29
7	9	401	2	2	6	17	13	2,031	$10\frac{1}{4}$	11	31
8	9	458	$2\frac{1}{4}$	3	5	18	13	2,150	$10\frac{3}{4}$	11	32
9	9	515	$2\frac{2}{3}$	3	8	19	13	2,270	$11\frac{1}{2}$	12	34
10	9	573	3	3	9	20	13	2,389	12	12	36
11	9	630	$3\frac{1}{4}$	4	10	8	14	1,108	$5\frac{2}{3}$	6	17
12	9	687	$3\frac{1}{2}$	4	10	9	14	1,247	$6\frac{1}{4}$	7	19
6	10	424	$2\frac{1}{4}$	3	7	10	14	1,385	7	7	21
7	10	495	$2\frac{1}{2}$	3	7	11	14	1,524	$7\frac{3}{4}$	8	23
8	10	565	3	3	9	12	14	1,663	$8\frac{1}{3}$	9	25
9	10	636	$3\frac{1}{4}$	4	10	13	14	1,801	9	9	27
10	10	707	$3\frac{1}{2}$	4	10	14	14	1,940	$9\frac{3}{4}$	10	29
11	10	778	4	4	12	15	14	2,078	$10\frac{1}{2}$	11	31
12	10	848	$4\frac{1}{4}$	5	13	16	14	2,217	$11\frac{1}{4}$	12	34
13	10	919	$4\frac{2}{3}$	5	14	17	14	2,355	$11\frac{3}{4}$	12	35
14	10	990	5	5	15	18	14	2,494	$12\frac{1}{2}$	13	36
6	11	513	$2\frac{2}{3}$	3	8	19	14	2,632	$13\frac{1}{4}$	14	40
7	11	599	3	3	9	20	14	2,771	14	14	42
8	11	684	$3\frac{1}{2}$	4	10	8	15	1,272	$6\frac{1}{2}$	7	19
9	11	770	4	4	12	9	15	1,431	$7\frac{1}{4}$	8	22
10	11	855	$4\frac{1}{3}$	5	13	10	15	1,590	8	8	24

No. 1 Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
11	15	1,749	8¾	9	26	14	18	3,206	16	16	48
12	15	1,909	9⅔	10	29	15	18	3,435	17¼	18	52
13	15	2,068	10⅓	11	31	16	18	3,664	18⅓	19	55
14	15	2,227	11¼	12	34	17	18	3,893	19½	20	58
15	15	2,386	12	12	36	18	18	4,122	20¾	21	62
16	15	2,545	12¾	13	38	19	18	4,351	21¾	22	65
17	15	2,704	13⅔	14	41	20	18	4,580	23	23	69
18	15	2,863	14⅓	15	43	21	18	4,809	24	24	72
19	15	3,022	15¼	16	46	22	18	5,038	25¼	26	76
20	15	3,181	16	16	48	23	18	5,268	26⅓	27	79
21	15	3,340	16¾	17	50	24	18	5,497	27½	28	82
22	15	3,499	17½	18	52	25	18	5,726	28¾	29	86
23	15	3,658	18⅓	19	55	26	18	5,955	29¾	30	89
24	15	3,817	19¼	20	58	11	19	2,807	14	14	42
8	16	1,448	7¼	8	22	12	19	3,062	15⅓	16	46
9	16	1,629	8¼	9	25	13	19	3,317	16⅔	17	50
10	16	1,810	9¼	10	28	14	19	3,572	18	18	54
11	16	1,991	10	10	30	15	19	3,828	19¼	20	58
12	16	2,171	11	11	33	16	19	4,083	20½	21	61
13	16	2,352	11¾	12	35	17	19	4,338	21¾	22	65
14	16	2,533	12¼	13	38	18	19	4,593	23	23	69
15	16	2,714	13⅔	14	41	19	19	4,848	24½	25	73
16	16	2,895	14½	15	43	20	19	5,104	25⅔	26	76
17	16	3,076	15½	16	46	21	19	5,359	26¾	27	80
18	16	3,257	16⅓	17	49	22	19	5,614	28¼	29	85
19	16	3,438	17¼	18	52	23	19	5,869	29⅓	30	88
20	16	3,619	18¼	19	55	24	19	6,124	30¾	31	92
21	16	3,800	19	19	57	25	19	6,379	32	32	96
22	16	3,981	20	20	60	26	19	6,635	33¼	34	100
23	16	4,162	20¾	21	62	27	19	6,890	34½	35	103
24	16	4,343	21¾	22	65	28	19	7,145	35½	36	106
25	16	4,524	22¾	23	68	12	20	3,393	17	17	51
26	16	4,705	23⅔	24	71	13	20	3,676	18½	19	55
9	17	1,839	9¼	10	28	14	20	3,958	19¾	20	59
10	17	2,043	10¼	11	31	15	20	4,241	21¼	22	64
11	17	2,247	11¼	12	34	16	20	4,524	22¾	23	68
12	17	2,451	12½	13	37	17	20	4,807	24	24	72
13	17	2,656	13⅓	14	40	18	20	5,089	25½	26	76
14	17	2,860	14⅓	15	43	19	20	5,372	27	27	81
15	17	3,064	15⅓	16	46	20	20	5,655	28¼	29	85
16	17	3,269	16⅓	17	49	21	20	5,938	29¾	30	89
17	17	3,473	17½	18	52	22	20	6,220	31¼	32	94
18	17	3,677	18½	19	55	23	20	6,503	32⅔	33	98
19	17	3,881	19½	20	58	24	20	6,786	34	34	102
20	17	4,086	20½	21	61	25	20	7,069	35⅓	36	106
21	17	4,290	21½	22	64	26	20	7,351	36¾	37	110
22	17	4,494	22½	23	67	12	21	3,741	18¾	19	56
23	17	4,699	23½	24	70	13	21	4,052	20¼	21	61
24	17	4,903	24⅔	25	74	14	21	4,364	22	22	66
25	17	5,107	25⅔	26	77	15	21	4,676	23½	24	70
26	17	5,311	26⅔	27	80	16	21	4,988	25	25	75
10	18	2,290	11½	12	34	17	21	5,299	26½	27	79
11	18	2,519	12¾	13	38	18	21	5,611	28¼	29	85
12	18	2,748	13¾	14	41	19	21	5,923	29¾	30	89
13	18	2,977	15	15	45	20	21	6,235	31¼	32	94

No. 1 Table—*continued.*

Height.	Diameter	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
21	21	6,546	32¾	33	98	17	23	6,357	32	32	96
22	21	6,858	34⅓	35	103	18	23	6,731	33¾	34	101
23	21	7,170	36	36	108	19	23	7,105	35⅔	36	107
24	21	7,481	37½	38	112	20	23	7,479	37½	38	112
25	21	7,793	39	39	117	21	23	7,853	39⅓	40	118
26	21	8,105	40½	41	121	22	23	8,227	41¼	42	124
12	22	4,105	20½	21	61	23	23	8,600	43	43	129
13	22	4.448	22½	23	67	24	23	8,974	45	45	135
14	22	4,790	24	24	72	25	23	9,348	46¾	47	140
15	22	5,132	25¾	26	77	26	23	9.722	48¾	49	146
16	22	5,474	27½	28	82	27	23	10,096	50½	51	151
17	22	5,816	29¼	30	88	12	24	4,886	24½	25	73
18	22	6,158	30¾	31	92	13	24	5,293	26½	27	79
19	22	6,500	32½	33	97	14	24	5,700	28½	29	85
20	22	6,842	34½	35	103	15	24	6,107	30⅔	31	92
21	22	7,185	36	36	108	16	24	6,514	32¾	33	98
22	22	7,527	37¾	38	113	17	24	6,922	34¾	35	104
23	22	7,869	39⅓	40	118	18	24	7.329	36¾	37	110
24	22	8,211	41¼	42	124	19	24	7,736	38¾	39	116
25	22	8,553	42¾	43	128	20	24	8,143	40¾	41	122
26	22	8,895	44½	45	133	21	24	8,550	42¾	43	128
12	23	4,487	22½	23	67	22	24	8,957	44¾	45	134
13	23	4,861	24⅓	25	73	23	24	9 364	46¾	47	140
14	23	5,235	26¼	27	79	24	24	9,772	49	49	147
15	23	5,609	28	28	84	25	24	10,179	51	51	153
16	23	5,983	30	30	90	26	24	10,586	53	53	159

No. 2, or Revised Table.

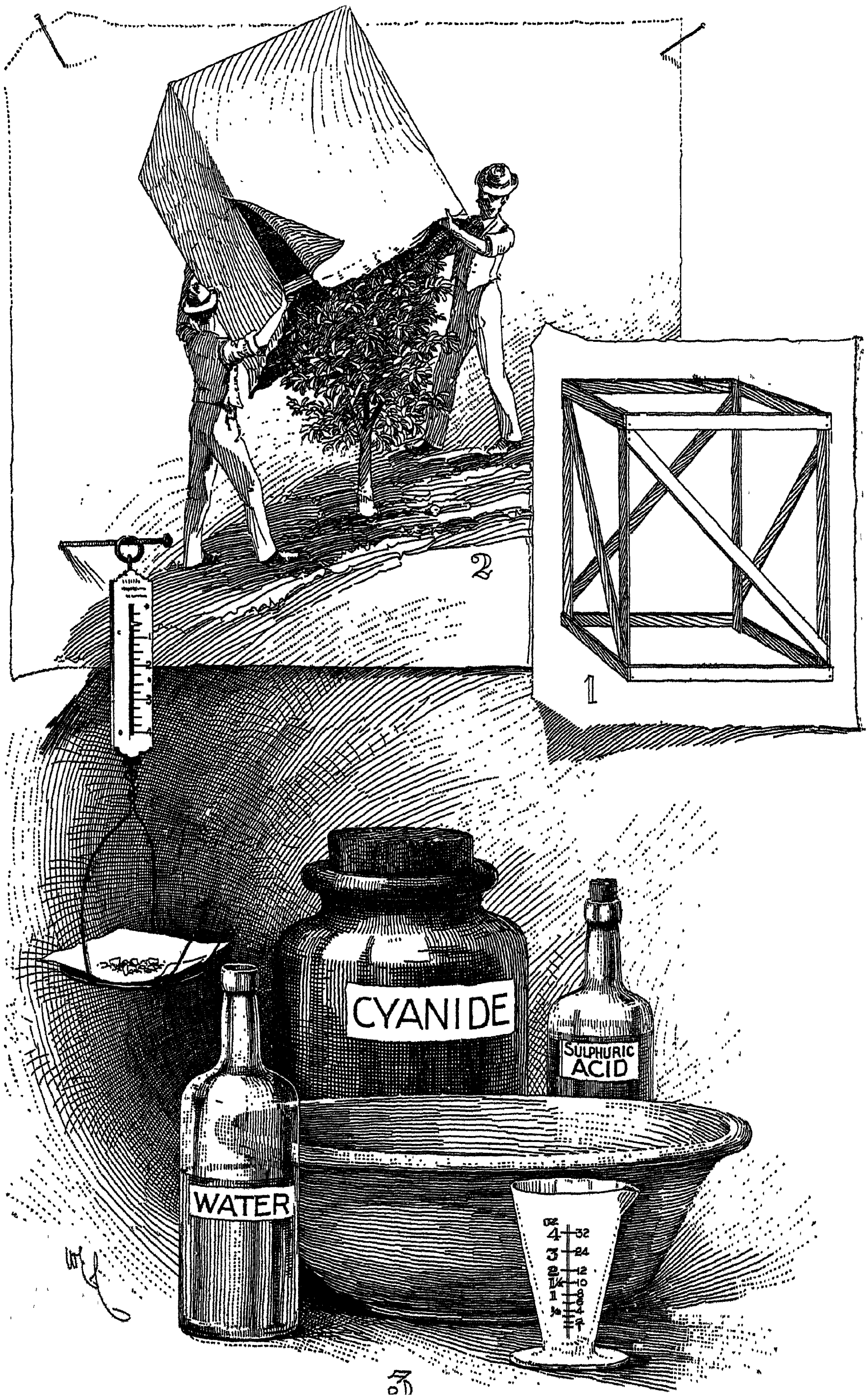
4	3	25	½	1	2	8	8	362	2	2	6
4	4	45	½	1	2	9	8	407	2⅓	2½	7
5	4	57	½	1	2	10	8	452	2⅔	3	8
6	4	68	¾	1	2	11	8	498	3	3	9
7	4	79	¾	1	2	12	8	543	3¼	3½	10
4	5	71	¾	1	2	6	9	344	2	2	6
5	5	88	¾	¾	3	7	9	401	2⅓	2½	7
6	5	106	¾	¾	3	8	9	458	2⅔	3	8
7	5	124	¾	¾	3	9	9	515	3	3	9
8	5	141	1	1	3	10	9	573	3⅓	3½	10
4	6	102	¾	1	2	11	9	630	3⅔	4	11
5	6	127	1	1	3	12	9	687	4	4	12
6	6	153	1	1	3	6	10	424	2½	3	7
7	6	178	1	1	3	7	10	495	2¾	3	8
8	6	204	1¼	1¼	4	8	10	565	3¼	3½	10
9	6	229	1⅓	1⅓	4	9	10	636	3⅔	4	11
4	7	139	1	1	3	10	10	707	4	4	12
5	7	173	1	1	3	11	10	778	4½	4½	13
6	7	208	1¼	1½	4	12	10	848	5	5	15
7	7	242	1½	1½	5	13	10	919	5¼	5½	16
8	7	277	1⅔	2	5	14	10	990	5⅔	6	17
9	7	312	1¾	2	5	6	10	513	3	3	9
10	7	346	2	2	6	7	11	599	3½	4	10
6	8	271	1¾	2	5	8	11	684	4	4	12
7	8	317	1¾	2	5	9	11	770	4½	5	13

No. 2, or Revised Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
10	11	855	5	5	15	14	15	2,227	12¾	13	38
11	11	941	5½	6	16	15	15	2,386	13¾	14	40
12	11	1,026	6	6	18	16	15	2,545	14½	15	43
13	11	1,112	6⅓	7	19	17	15	2,704	15½	16	46
14	11	1,197	7	7	21	18	15	2,863	16⅓	17	49
15	11	1,283	7¼	8	22	19	15	3,022	17¼	18	52
16	11	1,368	7¾	8	23	20	15	3,181	18¼	19	55
6	12	611	3½	4	10	21	15	3,340	19	19	57
7	12	713	4	4	12	22	15	3,499	20	20	60
8	12	814	4⅔	5	14	23	15	3,658	21	21	63
9	12	916	5¼	6	16	24	15	3,817	22	22	66
10	12	1,018	5¾	6	17	8	16	1,448	8¼	9	25
11	12	1,120	6½	7	19	9	16	1,629	9⅓	10	28
12	12	1,221	7	7	21	10	16	1,810	10⅓	11	34
13	12	1,323	7½	8	22	11	16	1,991	11⅓	12	34
14	12	1,425	8	8	24	12	16	2,171	12½	13	37
15	12	1,527	8¾	9	26	13	16	2,352	13½	14	40
16	12	1,629	9⅓	10	28	14	16	2,533	14½	15	43
17	12	1,730	10	10	30	15	16	2,714	15½	16	46
18	12	1,832	10½	11	31	16	16	2,895	16⅔	17	50
19	12	1,934	11	11	33	17	16	3,076	17⅔	18	53
20	12	2,036	11⅔	12	35	18	16	3,257	18⅔	19	56
7	13	836	4¾	5	14	19	16	3,438	19¾	20	59
8	13	956	5½	6	16	20	16	3,619	20⅔	21	62
9	13	1,075	6	6	18	21	16	3,800	21¾	22	65
10	13	1,195	7	7	21	22	16	3,981	22¾	23	68
11	13	1,314	7½	8	22	23	16	4,162	24⅓	25	73
12	13	1,433	8¼	9	25	24	16	4,343	25⅓	26	76
13	13	1,553	9	9	27	25	16	4,524	26⅓	27	79
14	13	1,672.	9⅔	10	27	26	16	4,705	27½	28	82
15	13	1,792	10¼	11	31	9	17	1,839	10½	11	31
16	13	1,911	11	11	33	10	17	2,043	11⅔	12	35
17	13	2,031	11⅔	12	35	11	17	2,247	12¾	13	38
18	13	2,150	12¼	13	37	12	17	2,451	14	14	42
19	13	2,270	13	13	39	13	17	2,656	15¼	16	46
20	13	2,389	13⅔	14	41	14	17	2,860	16⅓	17	49
8	14	1,108	6⅓	7	19	15	17	3,064	17⅓	18	52
9	14	1,247	7¼	8	22	16	17	3,269	18⅔	19	56
10	14	1,385	8	8	24	17	17	3,473	19¾	20	59
11	14	1,524	8¾	9	26	18	17	3,677	21	21	63
12	14	1,663	9½	10	28	19	17	3,881	22¼	23	67
13	14	1,801	10¼	11	31	20	17	4,086	23⅓	24	70
14	14	1,940	11¼	12	34	21	17	4,290	25	25	75
15	14	2,078	12	12	36	22	17	4,494	26¼	27	79
16	14	2,217	12⅔	13	38	23	17	4,699	27½	28	82
17	14	2,355	13½	14	40	24	17	4,903	28⅔	29	86
18	14	2,494	14¼	15	43	25	17	5,107	29¾	30	89
19	14	2,632	15	15	45	26	17	5,311	31	31	93
20	14	2,771	16	16	48	10	18	2,290	13	13	39
8	15	1,272	7¼	8	22	11	18	2,519	14⅓	15	43
9	15	1,431	8¼	9	25	12	18	2,748	15¾	16	47
10	15	1,590	9	9	27	13	18	2,977	17	17	51
11	15	1,749	10	10	30	14	18	3,206	18⅓	19	55
12	15	1,909	11	11	33	15	18	3,435	19⅔	20	59
13	15	2,068	11¾	12	35	16	18	3,664	21	21	63

No. 2, or Revised Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
17	18	3,893	22¼	23	67	21	21	6,546	38	38	114
18	18	4,122	24	24	72	22	21	6,858	39¾	40	119
19	18	4,351	25½	26	76	23	21	7,170	41½	42	124
20	18	4,580	26¾	27	80	24	21	7,481	43⅓	44	130
21	18	4,809	28	28	84	25	21	7,793	45	45	135
22	18	5,038	29⅓	30	88	26	21	8,105	47	47	141
23	18	5,268	30⅔	31	92	12	22	4,105	24	24	72
24	18	5,497	32	32	96	13	22	4,448	26	26	78
25	18	5,726	33⅓	34	100	14	22	4,790	28	28	84
26	18	5,955	34⅔	35	104	15	22	5,132	30	30	90
11	19	2,807	16	16	48	16	22	5,474	32	32	96
12	19	3,062	17½	18	52	17	22	5,816	33¾	34	101
13	19	3,317	19	19	57	18	22	6,158	35¾	36	107
14	19	3,572	20⅓	21	61	19	22	6,500	37¾	38	113
15	19	3,828	22	22	66	20	22	6,842	39⅔	40	119
16	19	4,083	23⅓	24	70	21	22	7,185	41⅔	42	125
17	19	4,338	25⅓	26	76	22	22	7,527	43⅔	44	131
18	19	4,593	26¾	27	80	23	22	7,869	45½	46	136
19	19	4,848	28¼	29	85	24	22	8,211	47½	48	142
20	19	5,104	29¾	30	89	25	22	8,553	49½	50	148
21	19	5,359	31¼	32	94	26	22	8,895	51⅓	52	154
22	19	5,614	32⅔	33	98	12	23	4,487	26¼	27	79
23	19	5,869	34	34	102	13	23	4,861	28⅓	29	85
24	19	6,124	35⅔	36	107	14	23	5,235	30⅓	31	91
25	19	6,379	37	37	111	15	23	5,609	32⅔	33	98
26	19	6,635	38½	39	115	16	23	5,983	34¾	35	104
27	19	6,890	40	40	120	17	23	6,357	37	37	111
28	19	7,145	41¾	42	125	18	23	6,731	39	39	117
12	20	3,393	19½	20	58	19	23	7,105	41¼	42	124
13	20	3,676	21	21	63	20	23	7,479	43⅓	44	130
14	20	3,958	22⅔	23	68	21	23	7,853	45⅓	46	136
15	20	4,241	25	25	75	22	23	8,227	47⅔	48	143
16	20	4,524	26¾	27	80	23	23	8,600	49¾	50	149
17	20	4,807	28	28	84	24	23	8,974	51¾	52	155
18	20	5,089	29⅔	30	89	25	23	9,348	54	54	162
19	20	5,372	31¼	32	94	26	23	9,722	56	56	168
20	20	5,655	33	33	99	27	23	10,096	58¼	59	175
21	20	5,938	34½	35	103	12	24	4,886	28½	29	85
22	20	6,220	36	36	108	13	24	5,293	30¾	31	92
23	20	6,503	37¾	38	113	14	24	5,700	33	33	99
24	20	6,786	39⅓	40	118	15	24	6,107	35½	36	106
25	20	7,069	41	41	123	16	24	6,514	37¾	38	113
26	20	7,351	42⅔	43	128	17	24	6,922	40	40	120
12	21	3,741	21⅓	22	64	18	24	7,329	42½	43	127
13	21	4,052	23¼	24	70	19	24	7,736	44¾	45	134
14	21	4,364	25½	26	76	20	24	8,143	47	47	141
15	21	4,676	27¼	28	82	21	24	8,550	49½	50	148
16	21	4,988	29	29	87	22	24	8,957	51¾	52	155
17	21	5,299	30¾	31	92	23	24	9,364	54	54	162
18	21	5,611	32⅔	33	98	24	24	9,772	56½	57	169
19	21	5,923	34½	35	103	25	24	10,179	58¾	59	176
20	21	6,235	36¼	37	109	26	24	10,586	61	61	183


2
1
CYANIDE
SULPHURIC ACID
WATER
3

The Nasal Fly of Sheep *(Œstrus ovis)* in Australia.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

SOME years ago the writer investigated the extent of the range of this fly in Australia among our sheep, and at the date of the publication of the report in this journal (April, 1905), it was confined to the Blue Mountains, specimens of the maggots having been obtained from sheeps' heads at Megalong, Gaylong, and Lithgow. Previously I had obtained a single mature larva from a water trough on a station near Gunnedah, which had evidently been sneezed out by an infested sheep when drinking. Earlier than this, Professor Stewart had contributed a paper to the *Gazette* (Vol 12 [1902], page 1542), illustrated with a plate, reporting the finding of maggots in the head of a sheep upon which he had carried out a *post mortem* for other reasons.

In 1909, however, we had several specimens sent in for determination from Koorawatha in the south-west, and Boggabri in the north, one of which developed into a fly, but in a damaged condition. Last year, during the months of October and November, specimens were received from the following places :—Wagga, 12th September, 1910 ; Michelago, 13th October, 1910; Wallabadah, 17th October, 1910 ; Tambar Springs, 6th October, 1910; Narromine, 1st November, 1910 ; Gunnedah district, 25th November, 1910. This record shows that either the fly is increasing in numbers and distribution, or the heads of butchers' sheep are coming more into consumption for Scotch broth ; for in all cases the specimens sent to us have been obtained from sheep that have been killed for mutton. The fact that they are found in the heads of fat mutton sheep also shows that the presence of nasal maggots alone does not do much actual harm to the condition of the sheep. No sheep-owner seems to have any suspicion of his sheep being troubled with the fly maggots until the animals are killed and cut up.

Distribution and Habits.

This nasal parasite is a well-known pest in England, and is almost cosmopolitan in its range, being found all over Europe, America, Africa, and the East. Probably wherever sheep are depastured the fly can be found. There are also several species common to the wild deer in the European forests.

Miss Ormerod, who goes into the question very thoroughly (Eleventh Report on Injurious Insects of 1887) gives a good account of its life history. She considers that the maggots are confined to the frontal sinuses of the head and horns, and though a number of persons have recorded finding them in

the brain, she points out that it is impossible for them to enter the brain cavity without perforating the bone, and the structure of the maggot shows that it could not live in brain tissue.

On the other hand, Mr. R. S. McDougall (Transactions of the Highland and Agricultural Society of Scotland, Vol. xi, 1899), in a paper entitled "Insect Pests of Domestic Animals," after giving a general account of the fly's habits, says:—"The flockmasters of Monmouthshire, Herefordshire, and the adjoining districts, are said to have had very heavy losses in 1896." This may be accounted for by the fact that the disease known as "Staggers," due to a cyst forming in the brain containing the immature forms of the tape-worm (*Tœnia cœnurus*) is often placed to the credit of the suspected nasal fly, which has nothing to do with this brain disease.

Most writers on the subject of the nasal fly have given accounts of the terror that the hum of this fly instils into the sheep as soon as they are aware of its presence among them. Bracy Clark, in 1797 (Transactions, Linnean Society), gives an interesting account of how the sheep rush about when this fly comes into the neighbourhood of the flock, which most of the modern writers upon the subject have quoted without any additional field observations. The writer has never seen the fly among the sheep in this country, nor can he obtain evidence that anyone has recorded observations made in the field in Australia.

The life history of the sheep nasal fly is well known, and has been worked out in other countries; but the perfect flies are very difficult to obtain, as the larvæ obtained from the sheep's head, even if they are full fed and ready to pupate, though they often transform into the pupa, seldom produce the adult insect. This is probably due to injuries in transit.

Though all the authorities the writer has consulted state that this fly lays living maggots in or about the nose of the sheep attacked, Professor Stewart, in his article previously noted, says: "The fly, taking advantage of a favourable opportunity, deposits its eggs on or near the nostrils of the sheep. In a few days the eggs are hatched, and the young larvæ, scarcely visible to the naked eye, crawl into the nostril." Riley (First Annual Report, Injurious Insects of Missouri, 1869) says: "The flies make their appearance early in June and July, and deposit living maggots in the nostrils of the sheep."

Some of the earlier authorities on sheep, such as Youatt, state that they deposit eggs, and this has been copied into many popular works. Riley states that Cockerill "obtained over 300 living moving maggots from one that was caught while she was after the sheep."

Like the horse bot-fly larvæ in the stomach of the horse, the sheep nasal maggots in the frontal sinuses of the head and horn cavities are only a temporary pest, for, as the maggots develop and become fully fed, they crawl downward into the nasal cavities, and are blown out by the infested sheep sneezing. When once free of these maggots, the sheep has to be reinfested by another fly dropping maggots in its nose. It is, therefore, not a disease in the strict sense of the word. It must, however, cause a great deal of

discomfort and pain to the unfortunate animal that has half a dozen maggots moving about in the delicate membrane of the nasal bones. We seldom have records of more than this number in a sheep's head. One correspondent sent six, and reported that he had taken them out of the horn cavities of a sheep killed for mutton—three in each horn. Mr. Moreau has recently shown me twenty-one maggots, in all stages of growth, taken out of the head of a sheep killed for mutton at Rylstone, where he says many sheep are infested.

LIFE HISTORY IN AUSTRALIA.

A number of well-developed maggots (larvæ) have been received from different parts of the State during the months of October and November; and as many of them have pupated in damp earth a few days after having been received, it is evident that this is about the time that they are full grown, leave the sheep, and pupate in the soil on which they fall when they drop out of the nose.

The Larva.

This is a semi-transparent, stout, white maggot, of a uniform thickness from the hind margin of the third thoracic segment behind the head, which forms a cone round the head segment, enclosing the slender hooked jaws. The upper or dorsal surface is rounded, while the under or ventral surface is flattened. The whole maggot is divided into twelve corrugated or wrinkled segments, the head and thoracic segments being merged into the broader abdominal segments. Between the eleventh and twelfth segments there is a deep, sharp cleft, leaving the hind end of the eleventh segment perfectly truncate or flat. This segment bears two large, rounded, chitinous, dark brown to black plates, in the centre of which are the spiracles or small openings by means of which the maggot breathes. Round the outer margin of this segment is a fleshy ridge, which fits close against the front surface of the twelfth segment. The maggot can contract the twelfth segment and fold it up against the spiracles, so that they are, when necessary, protected against any fluid that might choke the opening, and thus smother the maggot. The apical portion of the last segment forms a projecting rounded pad, convex on the upper surface, and covered with fine brown spines. On either side of this pad projects a rounded, finger-like tubercle. On the under surface there is a transverse band of fine, warty, brown spines, crossing the middle of each segment.

The head segment is hidden when viewed from above. It is furnished with two short, rounded tubercles, below which comes a retractile portion in which are embedded a pair of short, slender, incurved jaws or hooks.

When placed on a smooth surface the maggot moves very easily and rapidly, considering its obese form. Its method of progression is by contracting and extending the segments, and while the hooked jaws are extended, the bands of fine spines on the under surface and the anal segment are pressed down on to the surface over which the maggot is crawling. On account of its rounded, boat-like form on the back, when turned over it can easily roll back again on to its belly.

The Pupa.

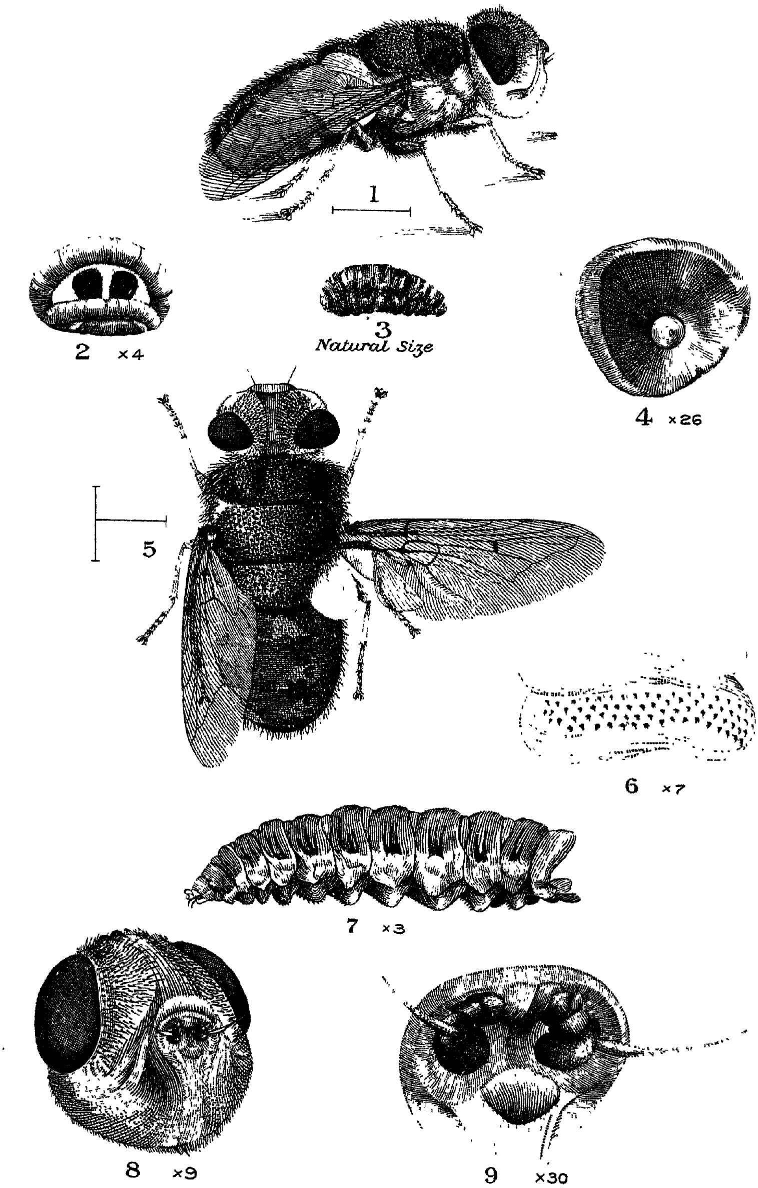
The full-grown larva takes just twenty-four hours to transform into the pupa in the damp earth. Three specimens received from Mr. S. G. Smith, of Narromine, who had carefully packed them in damp rags, arrived on the 1st November, 1910, and were under observation while pupating. The specimens had been taken from the sheep's head three days before. I placed them in the jar on moist earth. They were of the normal dirty-white colour, and very active; but towards evening began to get very much darker in colour, and the bands round the segments apparently thickened. On examination next morning (2nd November) it was found that the three had pupated during the night, and were of a light reddish-brown tint; but on the following morning had changed to dark brown, and gradually became almost black in tint.

Length, a little over half an inch, irregularly elongate oval, somewhat flattened on the under surface; the cephalic (head) portion smallest, broad and rounded to the apex, with a cavity or pit in the centre in which the two anal spiracles can be seen on the upper side. The upper surface of the pupal segment forms broad, smooth, transverse bands, divided off from each other by a fine ridge, while the under surfaces of the segments are banded with the spines of the larvæ, also separated from each other by a similar transverse ridge. The whole forms a stout, stiff, rugose, cocoon-like pupa, that would not be easily noticed in the ground where it pupates.

The Fly.

These pupæ were kept under close observation, and on the morning of the 5th December a perfect fly was found crawling about over the soil, and making a loud buzzing noise when handled. This specimen, kept under somewhat similar conditions to that which it would have experienced in the bush, remained in the pupal state from the 2nd November until the 5th December, from thirty-two to thirty-three days. Out of all the pupæ in the boxes this was the only one that came to maturity; all the others dried up.

The nasal sheep fly is short, broad, and cylindrical in form, measuring just under half an inch in length. Several writers have likened it to a large house-fly in general appearance, but when alive it is a very distinctive looking fly, quite unlike any species of house-fly. The most noticeable points are the large rounded head; short, pale, opaline-tinted wings; mottled body, and large feet-pads. The head is large, almost spherical if it were not somewhat flattened behind; the dark-brown eyes large and projecting; the three prominent shining black ocelli on a raised angular projection between the eyes, with a ridge-like process below them, above the pit in the front of the face, from which the small antennæ project. Below the antennæ the face and under portion of the head are dirty-white, smooth and convex, without any mouth or appendages. The back of the head is brown, covered with fine black warts and fine white pubescence. The thorax is broad and rounded; the upper surface and sides covered with granulated black warts, like those on the head; the under surface clothed with fine, downy, grey hairs; the



NASAL FLY OF SHEEP (*Œstrus ovis*).

(1) Side view of *Œstrus ovis*.
(2) End view of spiracles, with tip of abdomen. X 4.
(3) Pupa, natural size.
(4) Spiracle. X 26.
(5) Dorsal view of *Œstrus ovis*.
(6) Spines on under-surface of abdominal segments. X 7
(7) Larva. X 3
(8) Front view of head. X 9.
(9) Front view of head, showing form of antennæ. X 30.

wings, comparatively short, are slightly opaque or tinted with opaline white in some lights; the nervures brown, with three distinct black spots on the base of the main nervures; the legs brown, mottled with grey; the tarsi pale, with the pads and claws large and well adapted for clinging to a rough surface. The abdomen is broadly rounded to the tip.

The ground colour is difficult to define, as it changes in different lights, brownish and mottled with grey and black. The distinctive characteristic tints are the white, mottled, irregular bands on the segments, with a silvery lustre when alive. The segments are clothed with fine scattered brown hairs, stout and bristly towards the extremity.

Remedies.

There are many remedies and preventives proposed by English writers upon this subject, but there appears to be very little practical value in any of them. The difficulty is to say when a sheep is infested, as there are no symptoms at first, and infestation is only apparent in aggravated cases, when the maggots are full grown and all the harm has been done.

PROPOSED STANDARD FRUIT CASE.

MR. R. GORDON EDGELL, of "Bradwardine," Bathurst, writes:—

The Australasian fruit-growers, in conference at Hobart recently, decided to recommend the "Peacock" fruit case as the legal standard for the whole Commonwealth. But there are objections to that form of case, and, before this important matter is finally settled, it deserves the fullest consideration, because millions of cases will have to be made, and all fruit-growers and users will be affected.

All agree that the Imperial bushel is the best size, and the question of form is all that remains to be settled. For some years a very convenient "bushel" case has been largely used, but its capacity differs too greatly from that of the Imperial bushel to permit of its being legalised as the standard. Particulars of this case, with two suggested modifications and comparison with the "Peacock" case, are as follows:—

Capacity of the Imperial bushel: 2,218¼ cubic inches.

Present "bushel" case: 18 in. x 14 in. x 8⅞ in.; capacity, 2,236½ cub. in.; excess over Imperial bushel, 18¼ cub. in.

"Bushel" case made ⅛ in. shorter; capacity, 2,221 cub. in.; excess over Imperial bushel, 2¾ cub. in.

"Bushel" case made 1/10 in. narrower; capacity, 2,220¾ cub. in.; excess over Imperial bushel, 2½ cub. in.

"Peacock" case: 18 in. x 14¼ in. x 8⅔ in.; capacity, 2,223 cub. in.; excess over Imperial bushel, 4¾ cub. in.

It will be seen from the above that if the present "bushel" case were made either ⅛ in. shorter, or 1/10 in. narrower, than at present (all other dimensions remaining unaltered), its capacity would only very slightly exceed that of the Imperial bushel, and it would form a very suitable and convenient standard for general use.

The "Peacock" case does not so accurately conform to the bushel size; a little more timber is required in its construction; it is slightly weaker and heavier, takes up more space on ship board, and necessitates the employment of fractional dimensions which are not in general use, and cannot be measured with the ordinary carpenter's rule; also, being narrower, there may be some inconvenience in packing it.

Most of the above objections (except that of unusual fractional measurements) are slight, but this letter is written in the belief that even slight improvements are worth striving for, and also in the hope that it may elicit discussion from pens more competent than mine.

Blacksmithing for Farmers.

[Continued from page 143.]

A. H. E. McDONALD
(late Instructor in Agriculture, Hawkesbury Agricultural College).*

Lap Weld.

Fig. 9 shows one of the best methods of scarfing when simple straight bars are to be welded. A weld scarfed thus, is made by hammering directly downwards as shown by the arrows, and there is no danger of the two parts being forced away from each other by the pressure of the blows. Other kinds of welds are recommended for this class of work, but in most of them the blows cannot be directed at right angles to the work and the anvil, and consequently it is more difficult to obtain a satisfactory weld.

Link or Ring Weld.

Fig. 10 shows the scarfing for this weld. It is a simple form, and requires little explanation. As shown in the illustration, not much scarfing is required. After scarfing, the two ends are brought round and overlapped.

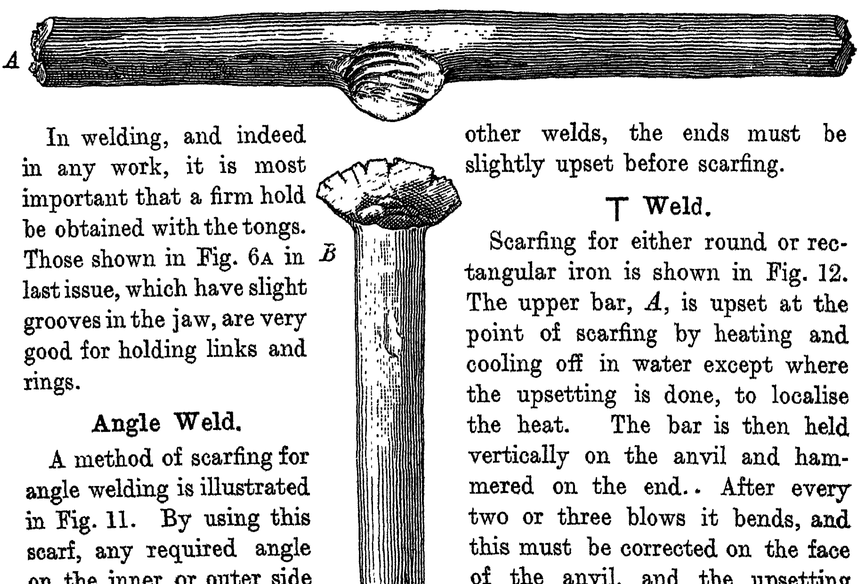


Fig. 12.—T Weld.

In welding, and indeed in any work, it is most important that a firm hold be obtained with the tongs. Those shown in Fig. 6A in last issue, which have slight grooves in the jaw, are very good for holding links and rings.

Angle Weld.

A method of scarfing for angle welding is illustrated in Fig. 11. By using this scarf, any required angle on the inner or outer side can be obtained. As in other welds, the ends must be slightly upset before scarfing.

T Weld.

Scarfing for either round or rectangular iron is shown in Fig. 12. The upper bar, *A*, is upset at the point of scarfing by heating and cooling off in water except where the upsetting is done, to localise the heat. The bar is then held vertically on the anvil and hammered on the end.. After every two or three blows it bends, and this must be corrected on the face of the anvil, and the upsetting proceeded with until a sufficient

* Now Inspector of Agriculture, North-west District.

thickness is obtained. The scarfing of *A* is done by the smith holding the bar with the pene in position on it while the striker uses the sledge.

Butt Weld.

Fig. 13 illustrates a good method of welding for certain classes of work. The bar A is heated, and with a pene and sledge, a cavity is made as shown. The bar to be welded is upset somewhat, and a head formed by driving it down into a bolster. The upset end of the bar prevents it going right through, and a head is formed which is given a conical shape with the hammer. Spikes and small bolts can be made in the same way.

To form the weld, the bar A is laid on the anvil and the scarfed end of B put into the cavity and struck a couple of blows on the other end. The work is then turned to have the bar A upwards, and B dropped into the bolster. The head prevents it going right through and welding is done by hammering down on A.

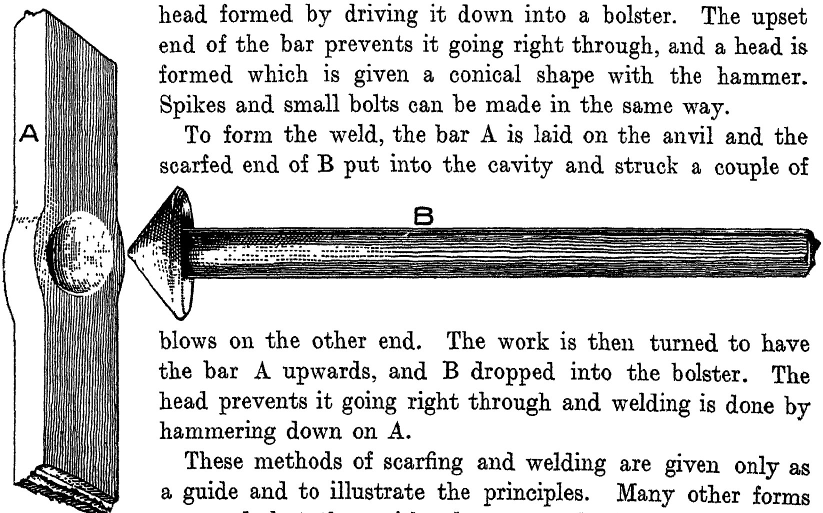


Fig. 13.
Butt Weld.

These methods of scarfing and welding are given only as a guide and to illustrate the principles. Many other forms are used, but the smith who grasps the idea of what is required, can adapt himself readily to circumstances, and devise methods for himself.

In welding, the length of the material decreases somewhat. A rough rule followed by many practical smiths is to allow a length equal to the thickness of the bars for shrinkage.

In the actual process of welding the scarfed points must be stuck together as soon as possible, as these being thin, cool out quickly.

Drawing down.

This means the reduction of the size of a bar of iron by hammering whilst it is at a high temperature. By proper direction of the blows the iron can be drawn down into any shape without injuring the strength. This can only be done at a high temperature, and, even then, the process is a slow one, and only advisable when it means a saving of labour in other ways, or better work being turned out. Where an article varies considerably in size at different points, as, for instance, a pair of tongs, less labour will be involved if a bar large enough to form the jaws is taken, and after forming this part, drawn down, than if a thinner bar is taken and upset to give size for the thick section. In the case of tong-making, the necessity of drawing down a thick bar sufficiently to form the handle, is avoided by drawing down a little and welding on a sufficient length of a thinner bar.

A blacksmith at work may draw down, upset, or weld his iron as it suits his purpose. As his whole object is to turn out work with the least amount of labour, it is difficult to set definite limits to the place of each.

The manner in which drawing down is done is determined by the kind of work. If it is merely a matter of tapering off to form a point, as when making a hook, the procedure is different from that followed when the size is suddenly reduced as in Fig. 14.

The first essential is a good heat. What is called a good welding heat gives the best results. If not heated sufficiently the bar will almost certainly split during the process.

When it is required to reduce the thickness of a bar from A to the thickness B, the first step is to fuller the bar, as in Fig. 14A. The fullering reduces the thickness abruptly at the right point, and it is an easy matter to get the thickness in 14B.

When the rounded fuller is used, no injury is done to the iron. A bar if broken shows a fibrous structure like the grain in wood, and it is this property which enables it to be bent at the will of the smith. It is absolutely essential that the fibre of the iron should be maintained. If iron is nicked with a sharp tool the fibre is destroyed, and it can easily be broken. A peculiarity of iron is that if a bar is cut round with a chisel it can be snapped off readily, and the fractured structure shows a crystalline nature instead of the fibrous condition seen when it is broken without nicking. When the fuller is used to make a depression, it merely changes the direction of the fibre without causing any break.

To draw the bar down after fullering, it is taken up to welding heat, laid upon the anvil and hammering commenced about 1½ inches from the end farthest from the smith. The bar must be worked down in square section without regard to its ultimate shape. For instance, if a ¾ inch round bar is to be reduced to ½ inch round, it must be worked down to about ½ inch square before commencing to round it. If an attempt is made to draw it down in a round form, splitting is sure to occur. When the bar is laid on the anvil and struck with the hammer, the effect is to make it spread sideways as well as to increase in length. The side-spread must be prevented by turning the bar a quarter round quickly so that it is hammered on every side.

The cooling of the bar prevents it being drawn down very much after each heating. The thickness of the bar, the quality of the metal, and the skill of the smith determine the amount. As a rule, with ordinary sized work, about 1½ to 2 inches are all that can be drawn down at each heating with safety.

When the size has been reduced sufficiently in square form, finishing off is commenced. The corners of each side are hammered flat, forming an eight-sided section. The corners are again flattened, until finally the round form is obtained. This procedure must be carefully followed, otherwise the iron will split.

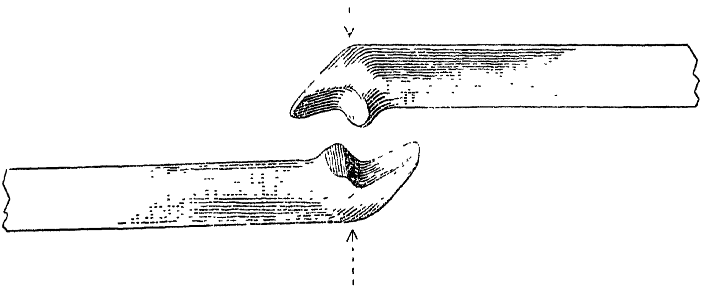


Fig. 9.—Lap Weld.

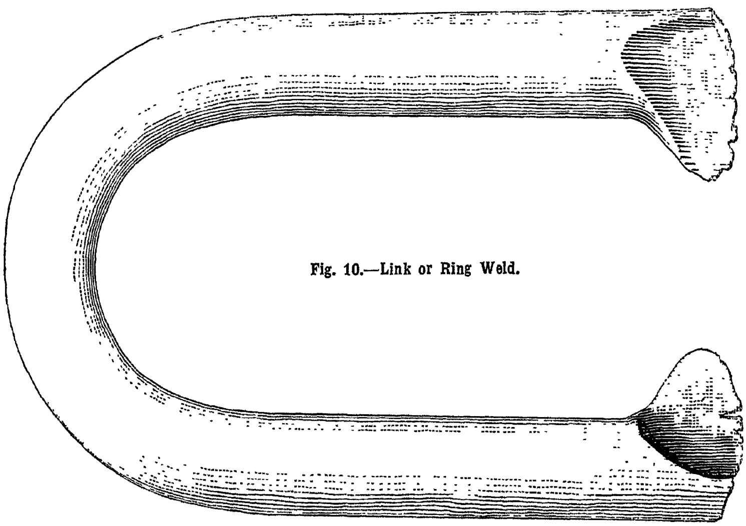
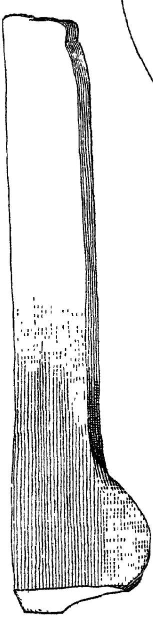


Fig. 10.—Link or Ring Weld.

SOME FORMS OF WELDS.



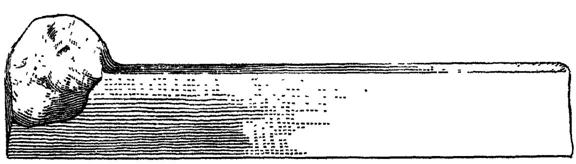


Fig. 11.—Angle Weld.

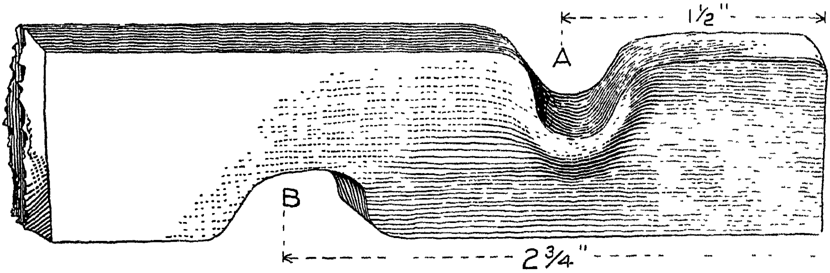


Fig. 15.—First stage in making Tongs, showing the fullered bar.

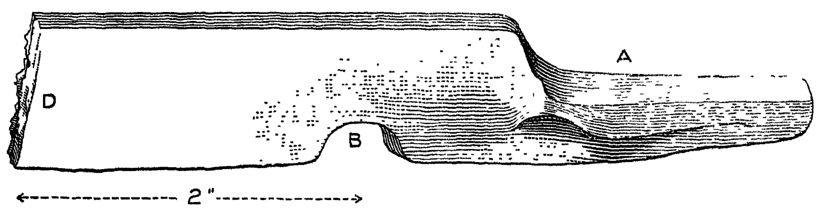


Fig. 16.—The second stage in making Tongs, showing the end drawn down to form the jaw.

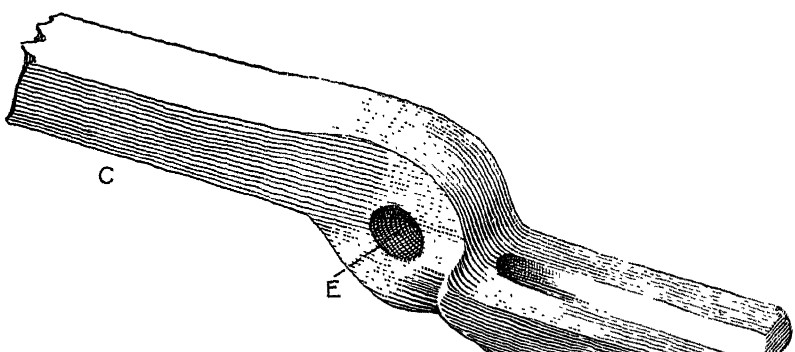


Fig. 17.—The third stage. The jaw is completely formed, the end C is drawn down in readiness for welding on the handle, and the hole E is punched.

MAKING TONGS.

When a bar is to be merely drawn down to a point, fullering is not done, but the procedure is otherwise the same.

Upsetting or Jumping-up.

This is a process followed by smiths to increase the bulk of metal at a certain point, and is the reverse of drawing down. It takes more time and care than the latter. A high temperature is required, and the heat must be localised—that is, confined to the spot where the upsetting is to be done. It follows therefore that a bar can be upset either at the ends or at any point along its length.

Different methods are followed. The bar may be taken in the hands and jumped down vertically on the anvil; it may be laid on the anvil and upset with the sledge; it may be held in the vice and upset with the hammer; or it may be held vertically on the anvil and upset in the same way.

When upsetting, it is necessary to see that the spread of the metal is in the right direction. If the blows are not carefully delivered, and the work straightened as required, the thickening will be in the wrong direction. During upsetting the fibres in the iron are forced apart, and hammering must be done after upsetting to restore the close texture.

Punching.

Different methods of punching are followed. Where it is not desired to expand the size of the section, a punch only a little smaller than the hole required is used. The metal is held over a bolster, or the hole in the anvil, and punched half-way through, then turned over and punched from the opposite side. A piece of the iron is punched out, leaving a hole nearly the right size. It is finished up to the correct dimensions by tapping in a mandrel and working on this. By this method a good deal of the metal is taken out, but the size of the section is not increased.

Another method is to punch out a small hole and gradually expand this hole with tapered tools until it is sufficiently large. When the holes are thus punched, very little metal is cut out, but the iron is swelled outwards a good deal. The eyes in hooks are often made in this way.

EXAMPLES.

A description of the methods followed in actual practice will indicate in the best way the different operations. In a short article of this kind it is impossible to deal with the more complicated work; and indeed it is not necessary, as the amateur can only expect to do simple work.

Most of the tools used by the smith are made by himself as occasion demands. This applies particularly to the tongs, which require to be made for or adapted to the particular class of work in hand, and as the making of tongs is simple, it will be dealt with first.

Tongs.

For a pair of tongs of ordinary size, a $1\frac{1}{2}$ in. x $\frac{5}{8}$ in. bar of iron a foot or so in length is taken, and after heating, is fullered as shown in Fig. 15, at A $1\frac{1}{2}$ inches from the end, and at B, $2\frac{3}{4}$ inches from the end. It is then drawn down to form the jaw, as shown at A in Fig. 16, and the bar cut off at D, 2 inches from the centre of the fuller at B. The end is then drawn down as at C in Fig. 17, and a thin bar welded on to form the handle. A half-inch hole is punched at E, and when the other jaw is finished in the same way the two are loosely riveted together. These measurements are not intended to be followed too closely; they are only given as guides. A little experience soon enables accurate estimates to be made.

Plough-wrench.

The size of iron required for the work is determined by the nuts to be fitted. Plough-wrenches are generally made to fit two sizes of nuts. Common sizes are $\frac{3}{4}$ inch and $\frac{1}{2}$ inch nuts.

To make such a wrench, take a $1\frac{1}{2}$ in. x $\frac{5}{8}$ in. bar and fuller 2 inches from the end on each side as in Fig. 18. The end is then rounded up as shown in Fig. 19, and a $\frac{1}{2}$ inch hole punched in as at C. This is further enlarged, and with a hot chisel a section of the iron cut out as shown by the dotted lines. The bar is then cut off at D, drawn down, and the jaws shaped up.

The other end of the wrench is formed from $1\frac{1}{4}$-inch iron in the same way. The two ends are then welded together and the handle given the correct finish as in Fig. 20. When forming the jaws they should be kept as thick as possible at the shoulders, as it is at that point that the greatest strain is put upon the wrench.

Small spanners are generally forged from one piece, and no welding is done. In the large wrenches welding saves a considerable amount of drawing down.

Laying a Pick.

Blister steel is used for this work. A convenient sized bar to take is 1 in. x $\frac{1}{2}$ in., about 2 inches long. It is drawn down in wedge form to about 3 inches, and left slightly wider than the blade of the pick. After drawing down, the lay and the pick are put into the fire and brought to a welding heat. Then with a few sharp blows the steel lay is stuck to the point of the pick, keeping the thick end of the lay at the point (Fig. 21). It is sufficient if the two are stuck together at the first heat; the welding is completed at the next.

If the pick has worn back into a very stumpy state, the steel point is stuck on as above but not completely welded, and a piece of tapered iron is stuck to the upper side of the lay, extending back with the thin end almost at the eye of the pick. The work is then returned to the fire, a fresh welding heat obtained, and the iron and steel lays welded to the pick together. About

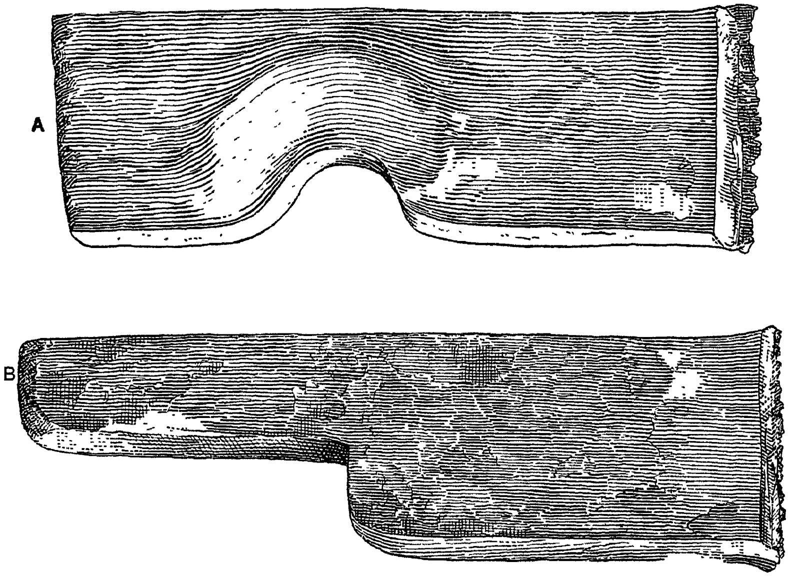


Fig. 14.—DRAWING DOWN. A—Bar fullered. B—Bar drawn down.

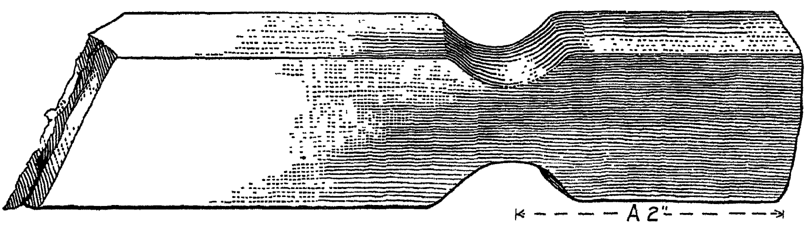


Fig. 18.—The first stage in making a Wrench—the bar fullered.

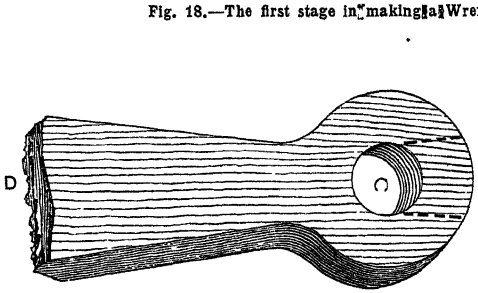


Fig. 19.—The end rounded and the hole punched. The centre piece, as marked by the dotted lines, is then cut out to allow the jaws to be formed.

Fig. 20.—Finished Plough-wrench.

Figs. 18-20.—MAKING A PLOUGH-WRENCH.

Fig. 22. A—**Lay for a Ploughshare.** B—**Share prepared for laying.**

Fig. 21.—Laying a Pick.
The steel lay is shown stuck on to the pick.

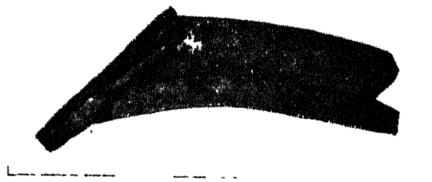


Fig. 23.—The lay ready for welding.

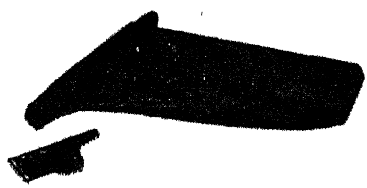


Fig. 25. -Laying the point of a Ploughshare.

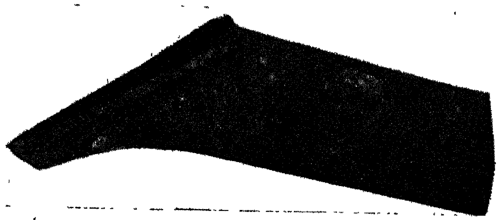


Fig. 24.—The finished Share

LAYING PICKS AND PLOUGHSHARES.

3 inches can be welded at each heat, and about three heats will be required to complete the welding. The object of laying with the iron is to increase the length of the pick blade. The steel lay is inserted between the iron and pick, but the subsequent hammering, when drawing the pick into shape, brings it out to form the hard cutting point.

In some cases the laying is done by splitting the point of the pick and inserting the lay. Welding then proceeds as usual.

After the welding has been done, the pick is drawn down into shape and tempered.

Tempering.

The temper of steel means the degree of hardness and the condition of the grain. Temper in rough tools is generally obtained by heating the steel and then cooling in cold water. If the temperature is too low the steel will be left soft, with a coarse grain, while if it is heated too much the steel will be brittle, and will probably have a coarse grain. The cooling also plays an important part. If it is too rapid the steel will be very hard, while if it is too slow it will be soft. To get a good temper, therefore, the temperature must be right, and the cooling must be done properly. This is a matter of some difficulty, and a little practice is required. It is better not to cool off too rapidly, because if the temper does happen to be a bit soft, it is a simple matter to temper again, but if the tool is made too hard and used, it will probably break at once.

The following method is generally adopted in tempering picks, mattocks, cold chisels, &c.:—A dull red heat is obtained, and the tool is chilled by immersing about ½ to 1 inch of the point in cold water for three or four seconds. It should be kept moving in the water. It is then withdrawn, and in a moment a pale straw colour should come into the point. After this a dark blue comes, and finally this turns into a pale blue. This pale blue colour must be waited for. Each colour is quite distinct. If the pale blue does not come the tool will be too hard, while if it passes off quickly the tool will be too soft. After the pale blue comes the tool is dipped in water and cooled right out. After tempering in this way the tool should be so hard that the file just grips it.

Laying a Ploughshare.

The laying consists of welding a piece of iron on the point and wing to replace the loss by wear. The size and length of iron used for the lay is determined by the size of the share. For a large share, 1 in. x ⅝ in. iron, long enough to extend from about 2 inches in front of the worn point to the rear point of the wing, with a little over, is used. This is prepared in the form shown in Fig. 22A, and bevelled on the lower side, leaving the upper side nearly level. Bevelling increases the width of the lay.

The share is prepared for laying as shown in Fig. 22B. The curving is done by heating the share and hammering it down while held in the vice. The

object of the curving is to allow for the bending backwards that takes place when welding. The result is that when welding is finished, the share is practically straight, while if the bending were not done the hammering during welding would leave the share bent back, and some difficulty would be experienced in getting it straight again.

The share is scarfed for welding by heating the wing and hammering it down, so that when the lay is put on, the two fit together well. When both are ready they are brought to a welding heat, and the share is held bottom up on the anvil by the smith with one hand, while with the other the point of the lay is laid on the point of the share and struck with the sledge by the striker. The point is finished up by the smith with the hammer. With the two attached in this way it is a simple matter to bring the lay down to the shape of the wing. It should project about ¼ inch out along the side of the wing.

Fig. 23 shows the lay attached to the point and hammered into shape ready for welding. It is got into place by first knocking the lay into the right position on the rear point of the wing, and it is then grasped there with the tongs and held while it is hammered in the centre and along the wing until it projects the same distance right along.

So prepared, the share is ready for the welding, which is done from the point backwards. The depression forming the frog of the shoe makes welding somewhat difficult at that point. This difficulty can be overcome by using the set hammer shown in Fig. 5, February *Gazette*. This is placed on the lay in the frog and struck with the sledge.

About four or five heats are usually required in welding a share such as that shown. The welding of 3 or 4 inches at a time is fairly good work. Fig. 24 shows the share after laying has been finished.

Laying the Point of a Share.

This consists of welding a piece of iron to the point of the share. Bar iron 1½ in. x ⅝ in. and 3 inches long is taken and scarfed as shown in Fig. 25. The lay is welded to the underside of the point, and when scarfing the lay, the hammering should be done on the opposite side from that which is to be in contact with the share, so that the projection shown in the lay will fit down well on to the share. The welding is similar to that adopted when laying a pick.

It will be noticed that iron is used in laying both the point and wing of a share. This is so soft that in its natural state it wears away rapidly. The wearing can be prevented by what is called "casting." After the share is laid, it is brought up to a welding heat, and at the same time a thin piece of cast-iron is heated to a dull red. While the welding heat is on the share, the red-hot cast-iron is rubbed over it in the fire. The heat of the iron melts the cast-iron, and a liquid coat is obtained. When sufficient of the cast-iron

has been melted, the share is taken from the fire, and with an old file or rasp the molten coating is spread evenly over the point of the share. The effect is to give a coating of intense hardness, which makes the share last very much longer. Any cast-iron, such as a broken saucepan, kettle, &c., can be used. The thinner it is the better, as it melts more easily.

[In this and next issue, Mr. T. G. Palgrave, Government Veterinary Surgeon, explains the principles of horse-shoeing from a veterinary point of view. In April *Gazette*, Mr. McDonald will treat of the blacksmith's work in shoeing, and complete the series. Keep this and last number.—Ed.]

Cheese Shipped to London from Hawkesbury Agricultural College.

On 1st October, 1910, twelve crates of cheese from the Hawkesbury Agricultural College were sent to the Agent-General in London; two in the Purser's cool room on R.M.S. "China," and ten in the ship's cool chamber on s.s. "Medic." On arrival, Mr. Coghlan placed the cheese in the hands of Mr. James Gillanders, of Tooley-street, London, who reported upon the shipment and also obtained opinions from other gentlemen connected with the trade.

Mr. Gillanders states that the cheese were exceptionally well crated and handled in every way possible, and appear to have been carried under best possible conditions, but if anything perhaps the temperature was a shade too low. The size and shape were right, but the colour should be a little more pronounced for the London market. The cheese were a little acidy, giving the curd more of the Cheshire than the Cheddar appearance.

Mr. A. J. Rowson, of Rowson, Hodgson, & Co., Ltd., considered the cheese an improvement in style and finish compared with any from Australia that he had previously examined. The make and flavour were good, but the colour would militate against the sale. Cheese should be either white or of a definite colour.

Mr. John H. Radmall, of John Radmall and Sons, also found the colour defective. He considered the flavour a little raw, and the texture a little tough, the curd appearing to have been slightly over-heated in the making.

Mr. John S. Hudson, of Hudson Bros., Ltd., reported that the cheese showed very good quality, and were of excellent texture and very close cutting; but they were certainly lacking in colour, and had a "sheepy" flavour.

The World's Stores, Ltd., considered the quality very fair for the time of the year; in fact they had not seen anything quite so good from Australia before. The cheese were well made and packed, but the flavour, though good, was rather too acidy to be popular, and the texture was somewhat "mealy." Cheese more of the Canadian or Cheddar character was required. The colour was also slightly mixed.

Commenting on these reports, Mr. J. G. McMillan, Dairy Instructor at the College, says the faults can be traced. The deficiency in depth of colour was due to the milk having been pasteurised; this was not allowed for when adding colouring matter, although double the usual quantity was put in. The cheese can easily be made a little firmer; they were intentionally made more meaty, as reports on the home market had indicated a demand for soft cheese. The Minister has approved of a further trial shipment being prepared, wherein an endeavour will be made to avoid the faults mentioned.

Mr. Coghlan disposed of the two crates sent per R.M.S. "China," at 55s. and 56s. per cwt. respectively; and of the ten per s.s. "Medic," seven realised 55s. and three 56s. per cwt. Mr. McMillan estimates that at a factory dealing with 1,000 gallons per day, with up-to-date appliances (refrigerator included), allowing for depreciation on building (£600) at 5 per cent.; plant (£500) at 10 per cent.; labour and firewood; the cost would be about ·41d. per lb. of cheese. If cheese were made entirely for export it would not be necessary to have a refrigerator, and the estimated cost would be reduced to ·3d. per lb. The expenses of manufacturing, landing, and selling cheese in London would be 1·37d. per lb.; or in the Sydney market ·9d. per lb. Assuming that 56s. per cwt. was received in London for cheese, a factory could afford to pay suppliers at the rate of 4½d. per gallon, and have sufficient balance to allow a 5 per cent. dividend on capital. Selling in Sydney at the same figure would allow of about 5d. per gallon being paid suppliers, and sufficient being left over to pay a dividend.

Sulphur for Fruit-trees.

In the *Gazette* for August, 1910, page 701, reference was made to an experiment by Mr. E. Scifleet, of Mudgee, with sulphur for American Blight (woolly aphis). Mr. D. Hawkins, fruit inspector, now gives results of a similar test by Mr. Joseph Cockburn, of Toronto.

Mr. Cockburn had some peach, blood plum, and apricot trees affected with San José scale, black aphis, brown scale, and (in the peach trees) peach leaf-curl. With a half-inch bit he bored a hole in the trunks of some of the trees 8 or 10 inches deep, in a direction slanting downwards, and filled the hole with sulphur made into paste, ramming it tightly. This was done about fifteen months ago. This season the treated trees are perfectly free of any disease, except a few peach leaves affected with curl. There is no sign of San José scale, black aphis, or brown scale. They are brighter in colour, have made better growth, and carry at least 30 per cent. more fruit of better quality than the others. All the other trees were sprayed with different washes, but are not nearly so clean and healthy looking as the ones treated with sulphur. Mr. Cockburn says they have received the same manuring and cultivation. Mr. Hawkins, who has kept a careful watch upon the experiment, is convinced that the sulphured trees have shown a vast improvement over the sprayed ones.

Varieties of Oats, Barley, and Rye recommended by the Department of Agriculture.

At the Departmental Wheat Conference, held on the 17th and 18th January, and attended by Managers of Experiment Farms and Inspectors of Agriculture, a discussion took place as to the best varieties of other cereal crops in cultivation.

The following were considered the best varieties of oats:—

Algerian—for the State generally, and western districts in particular.

Carter's Royal Cluster—for the cool, and cold and moist districts (as Bathurst and Glen Innes).

White Tartarian—for the cold and moist districts (as Glen Innes); but the palatability of this oat to stock was disputed.

Surprise, Potato and *Abundance* were also considered good oats.

Red Rust Proof has given good results at Wagga Farm.

Bathurst Early—a new cross-bred made by Mr. J. T. Pridham, was very highly commended.

The need for the introduction of a good grain oat was emphasised.

The following were considered good varieties of barley and rye:—

Feed Barleys:—*Skinless*—for green winter feed and stock grain in the drier districts.

Cape—for green fodder and stock grain in the cooler districts.

Malting Barleys:—*Standwell*, *Maltster*, *Goldthorpe*, and *Invincible*, which are all similar, and *Kinver's Chevalier*. For the drier districts *Standwell* was considered best.

Ryes:—*Black Winter*—for early winter fodder and grain.

Emerald—for late feed and straw.

White—for collar-making.

It was pointed out that ryes are only suitable for cultivation on poor soils, generally in cold districts, for green feed. They are hardly suitable for grain at any time, as the yield is small.

Powellising of Wood for Butter-boxes.

The Dairy Expert of the Department of Agriculture recently submitted six butter-boxes, made from Dorrigo Crab Apple timber, to the Powellising Company, in order to test the value of the process in connection with the manufacture of butter-boxes. Of course, the usual method of Powellising as a specific remedy against white ants, which includes the use of arsenic, was not adopted, treacle alone being used to drive out all the sap and any essential oils that might give a flavour to butter, and also to shrink and season the timber.

The Dairy Expert reports that the Powellising of the wood in this way is not suitable for timber which is to be used for the manufacture of butter-boxes, the reasons being that the wood is very much stained by the process, and its appearance thereby rendered, practically speaking, unfit for our ideas of butter-boxes. In addition to the undesirable appearance referred to, the wood gave forth a very strong smell of treacle, the flavour of which would be

absorbed by the butter to the detriment of the latter. The butter parchment paper was also stained on being dampened and brought into contact with the Powellised wood.

It will thus be seen that this process cannot, in its present form at least, be utilised in the preparation of timber for butter-boxes.

The effect of Dorrigo Crab Apple timber, in its natural state, upon the butter may be seen from the fact that two boxes made of this timber were sent to the Port Macquarie Dairy Company to be packed with butter, to be compared with similar butter packed in New Zealand White Pine boxes. The butters, by courtesy of Messrs. Prescott, Limited, were held in cold store for about six weeks, when they were examined. Though the difference in quality was not great, the Dairy Expert was able to distinguish the butters without seeing from which box the sample was taken. The flavour of the butter packed in the Dorrigo Crab Apple boxes was slightly affected on the part of the butter close to the timber.

Rhodes Grass v. Paspalum.

In the *Queensland Agricultural Journal* for December, Mr. Thomas Purcell, of Dunmore Farm, Atherton, Q., says that four years ago he planted 90 acres in the proportion of 1 Rhodes to 13 Paspalum, and that to-day the paddock is at least three-fourths Rhodes. He finds that Rhodes gives a much better growth by spelling, either in winter or in dry weather, than Paspalum; that by surface measurement it supplies three times as much fodder in dry weather; and that, allowing for difference in cream prices, &c., it gives over 4s. per cow more per month. His silos have been untouched for two years, but when he was depending on Paspalum they were continuously working, and his neighbours feeding Paspalum are always emptying theirs.

Rhodes Grass (*Chloris gayana*) was introduced some years ago from South Africa, and Mr. Sylvester Browne, of Singleton, was the first to bring it into prominence, if not actually the first to import it. It has creeping stems, which root at the joints, but in a thick stand the stems are upright. Analyses made in the Chemical Laboratory of this Department show that its nutritive value is greater than that of *Paspalum dilatatum*, and that it is richer in protein, or flesh-forming constituent. The percentage of crude fibre is also less in Rhodes Grass. Otherwise the two grasses appear to be very similar. The palatability of Rhodes to stock is commended on all sides.

The general opinion appears to be, that Rhodes Grass will find its true home in dairying districts which have a less rainfall than those where Paspalum is king, as it is much more drought-resistant; but we cannot dispose of the question on this ground alone. As Mr. P. Grant, of Macksville, pointed out in last September *Gazette*, "if our stock could talk they would express their satisfaction in having a change from the valuable but . . . monotonous Paspalum."

To throw light upon this important question, we should be glad if those of our readers who have tried Rhodes grass, whether in dairying or other districts, would communicate with the Department. Farmers are particularly requested to give their *experience*, not their *opinions*, as there are often flaws in the most careful judgment. By collating the information obtained in this way the true place of Rhodes and Paspalum may be found much more quickly than if each farmer is left to solve the question for himself by what may prove costly and long-continued experiments.

Horse-shoeing

T. G. PALGRAVE, M.R.C.V.S., Government Veterinary Surgeon.

BEFORE entering on the actual practical part of horse-shoeing, it will not be amiss to deal briefly with the structure of the horse's foot.

The foot consists of various living structures which differ in shape and texture, enclosed in a horny box known as the hoof. The fore feet are more rounded in general outline than the hind, and are less pointed at the toe. The fore and hind feet should be in pairs, *i.e.*, the fore feet should be similar in size and shape, as also should the pair of hind feet; and the hind feet should be proportionate in size to the fore. If any marked difference in size or shape exists between a pair of feet, whether fore or hind, disease must be suspected, though it is necessary to bear in mind that such difference may perhaps be due to a healthy hoof having been broken or over-much rasped.

The quality of the hoof depends upon the breed of horse, and upon the nature of the soil and climate of the country where he is reared. Some hoofs are brittle and crack readily; some are softer in quality; some again are hard, flinty, and strong; while others have a tendency to break and crumble away. If the quality of the horn is defective it is usually due to constitutional causes, and the farrier cannot hope to remedy the condition. The best he can do is to avoid undue pressure upon it, and be very careful in driving the nails.

For purposes of description the hoof is divided into wall, sole, and frog.

The Wall.

The wall is seen when the foot rests on the ground. It covers the front and sides of the foot, extends from the coronet to the bottom of the hoof, and forms the greater part of the horny box which contains the sensitive

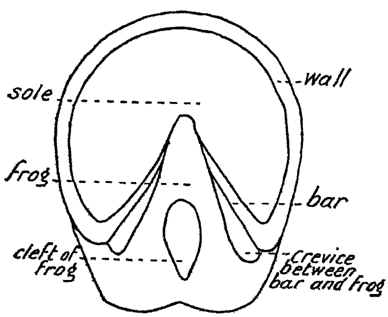


Fig. 1.—Diagram of Sole surface of a fore foot.

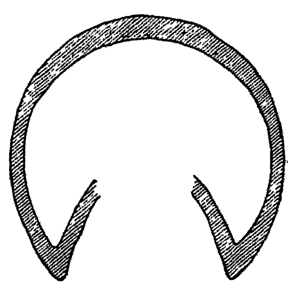


Fig. 2.—Diagram of transverse section of Wall and Bars, showing variations in thickness.

and bony structures of the foot. The lowest part of it is shown in Fig. 1, which figure illustrates the surface of the hoof which in a natural state comes in contact with the ground. From the coronet the wall slopes downwards and slightly outwards, its lower circumference being thus greater than its upper ; its greatest height is in front, diminishing as it passes backwards towards the heels.

At the heels the wall turns sharply inwards towards the centre of the sole and on either side of the frog, thus forming the bars. (Fig. 1.) The bars not only materially increase the bearing surface of the wall, but also act as buttresses to the posterior portion of the hoof. When the bars are cut away the structural resistance to contraction of the hoof is removed, and shrinking in of the heels results in almost every case.

The lower surface of the wall surrounds the sole, and is somewhat more prominent as a general rule than is the sole surface. Thus the lower border of the wall forms the principal bearing surface of the foot.

At this point it is very needful to draw attention to a somewhat popular but none the less dangerous practice, namely, that of taking the so-called "white line" as a guide in removing horn from the wall. Where the wall and sole join there is a line of horn lighter in colour than the balance of the horn. It is often thought that the horn of the wall should be reduced by paring, rasping, or both, till this "white line" is visible all round the bearing surface of the hoof. A greater fallacy could not exist, and it may be taken as a rule that when the "white line" is visible to the above extent, the foot has been *over-reduced.*

The wall varies in thickness from the toe to the heel, being thickest at the toe (Fig. 2), but does not vary from above downwards. In structure it is fibrous, the fibres running parallel to each other, and it is hardest externally, becoming softer as it approaches the interior of the foot. The hard, tough, outer layer is not only wear-resisting, but also guards the deeper layers from evaporation, thus maintaining the whole at the degree of hardness and toughness best calculated to preserve the strength and elasticity of the horn.

The inner surface of the wall consists of a large number—from 500 to 600—of very thin horny plates or ridges, running downwards and somewhat forwards, parallel with each other. These are known as the horny laminæ (leaves), and each one fits in between two sensitive laminæ (Fig. 3). The object of this arrangement will be referred to later when the structure of the sensitive foot is under consideration, as will also be the coronary band which rests in a groove around the inside of the upper circumference of the wall.

The Sole.

The sole can best be described as being the floor of the foot, or bottom of the horny box (Fig. 1). Lying within the lower border of the wall, it is divided at the back of the foot by a cleft, which is roughly triangular in shape, and into which the horny frog fits. At the heels it lies between the

wall and bars. Its ground surface is slightly concave, and when the unshod foot rests on a level surface the centre of the sole has no bearing on such surface. Its structure is fibrous, and it is hardest without, as is the wall, and with the same object.

The Frog.

The horny frog is roughly triangular in shape (Fig. 1); the point, which is the hardest part, extending forward to the centre of the sole. On each side of the frog, and between it and the bars, is a deep crevice, which allows the frog to expand laterally when pressed upon—for example, when the foot rests upon the ground. The centre of the posterior portion of the frog shows a depression known as the "cleft." The function of the cleft is to allow increased power of contraction and expansion to the frog, and by breaking the smoothness of its lower surface, to give a better grip of the ground. The frog is fibrous in structure, and its chief characteristics are toughness and elasticity.

Both horny sole and horny frog have their counterparts in the interior of the foot in the sensitive sole and sensitive frog.

The Sensitive Foot.

The sensitive foot consists of the sensitive laminæ, sole and frog. It corresponds exactly to the horny structures forming the exterior of the foot, each sensitive portion being in exact juxtaposition to the corresponding horny part.

The sensitive foot is commonly known as the "quick," and is well furnished with blood-vessels for the purpose of supplying the necessary material for the production of horn. The sensitive structures named have the power of secreting and reproducing horn; and together with the coronary band—which will be described later, as owing to its special position and important functions, it is thought advisable to draw special attention to it—they repair the loss of horn which wear and tear are always causing.

The sensitive laminæ form a series of small parallel folds, corresponding to the horny laminæ, and between alternate sensitive laminæ the horny laminæ rest. Fig. 3 shows their arrangement and position. These laminæ secrete a softer variety of horn than that of the exterior of the wall, but this function is not very active; their most important use is that they form a firm connecting medium between the horny wall of the hoof and the corresponding portion of the sensitive foot.

The sensitive sole is that portion to which the horny sole is attached. It has a velvety appearance, being covered with very small hair-like projections termed papillæ. The papillæ afford a means of firm connection between this portion of the sensitive foot and the floor of the hoof (sole), and also secrete the horn fibres of the horny sole.

In structure, the sensitive frog resembles the sensitive sole, but its papillæ are smaller. The irregular surface of the horny frog is exactly reproduced in the sensitive counterpart. A marked difference between the sensitive

frog and other portions of the sensitive foot is that the frog is not attached to the bones of the foot except by its point, but lies between the two posterior branches of the coffin bone—sometimes called the "wings"—and has as a basis a mass of soft tissues forming a pad. This pad, which extends from side to side of the foot, between the lateral cartilages, and fills up the space within the hoof behind the coffin bone, forms the bulbs of the heels. It is fibrous and elastic in texture, and largely prevents concussion when the foot comes to the ground.

The Coronary Band.

The coronary band is a most important structure, lying between the upper extremities of the sensitive laminæ—which, it may be here remarked, do not cover the whole of the upright portions of the sensitive foot—and the boundary

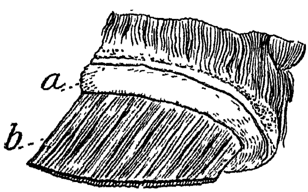


Fig. 3.—Foot with hoof removed, showing:—

a Coronary band.
b The sensitive laminæ.

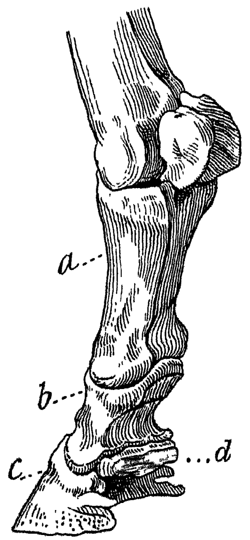


Fig. 4.—Bones of the Pastern and Coffin joints:—

a Long pastern bone.
b Short pastern bone.
c Coffin bone.
d Navicular bone.

separating the skin from the sensitive portions of the foot. Fig. 3 shows the coronary band. This band is convex in shape, lies in the groove already mentioned as existing on the inner side of the upper border of the wall, and is turned inwards and downwards at the heels. On the surface of the coronary bands are numerous small projections (papillæ), which fit into minute openings in the groove in which the band lies. From each of these papillæ grows a horn fibre, while the spaces between them secrete horn of a softer consistency, the two products composing between them the substance of the wall.

As the coronary band is the source of production of the wall, it can easily be understood that the soundness of the wall depends upon the band being healthy, and thoroughly able to carry out its functions, and that any interference with the integrity of the band—no matter whether such interference is mechanical or due to disease—must result in defects of the wall.

The Bones.

The bones which enter into the formation of the foot are the lower portion of the short pastern bone (Fig. 4*b*); the coffin bone (Fig. 4*c* and Fig. 5); and the navicular or shuttle-bone (Figs. 6 and 7). The only ones to which a brief article of this kind need allude are the coffin and shuttle bones.

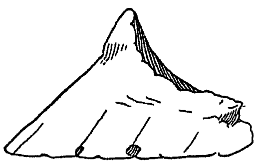


Fig. 5.—Side view of Coffin bone; this is the actual bone of the foot. *a* Its wing

Fig. 6.—Navicular or Shuttle bone, showing the back surface over which the flexor tendon plays.

The coffin or pedal bone lies entirely within the hoof, and completely fills the front portion of the horny box. It is of irregular shape, and is continued backwards by two projections or wings, which extend inside the hoof to a little beyond the quarters. From this point to the extremities of the heels the wall is not supported by bone, but by strong plates of gristle called the "lateral cartilages" (Fig. 8). When these cartilages become converted into bone they form the abnormal growth known as "sidebones."

The navicular, or shuttle bone, is a small narrow bone, placed across the back of the coffin joint, *i.e.*, the joint formed by the lower end of the short pastern bone and the coffin bone. Two aspects of this bone are shown in Figs. 6 and 7.

The Lateral Cartilages.

The lateral cartilages (Fig. 8) are situated partly within and partly without the hoof. In Fig. 8, the sloping line drawn across the cartilage shows where

Fig. 7.—Navicular bone, showing the "joint surface," where it is attached to the Coffin bone.

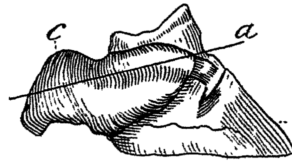


Fig. 8.—The Lateral Cartilage.
The line *a* shows where the upper border of the hoof would come in the complete foot. *b* is the coffin bone, and *c* the lateral cartilage.

the upper portion of the hoof would reach to. Being elastic they allow a certain amount of movement in the posterior portions of the foot—which

movement is essential to perfect action—and as they can yield to pressure they reduce any concussion consequent on blows on that portion of the foot, while their toughness provides a sufficiently firm surface for such attachment of the posterior portion of the hoof as is necessary. The part of the lateral cartilage which extends above the hoof can be easily felt in the living animal at the upper and back portion of the coronet. The frog pad lies between the lateral cartilages.

The Coronary-pad.

The coronary pad or cushion is a mass of tissue, similar in texture to the frog pad, which has already been described. It lies just above the upper border of the hoof, and gives elasticity and prominence to the coronet. At this part of the foot there are an enormous number of small nerves and blood-vessels, and this pad, besides forming a base for them to rest on, serves to protect them from being bruised against the bony structures beneath it.

The properties of horn may now be mentioned very briefly. Horn is tough, elastic, hard, and light, and being porous it absorbs moisture. Being a bad conductor of heat, it serves as a protection against snow, and equally against dry hot sand. In its natural healthy condition, a more efficient protective covering for soft and sensitive structures, or one better adapted to withstand wear, could not be devised.

In the practical work of horse-shoeing, the main points for consideration are the preparation of the foot for the shoe; the fitting and adjusting of the shoe; and the selection and making of the shoe itself. These will be dealt with in next issue.

(*To be continued.*)

Chilli Wine.

An excellent drink, taken either hot or cold; may also be used with lemonade, soda water, &c.:—

1½ lb. white sugar,
½ oz. citric acid,
2 quarts boiling water,
3 teaspoonfuls essence of lemon,
2 tablespoonfuls burnt sugar (well burnt),
30 to 40 bird's-eye chillies.

Bruise or break chillies; pour boiling water on acid, sugar, and chillies; and add burnt sugar. When cold, strain, and add essence of lemon.—S. Bowles.

List of Fertilisers in New South Wales

F. B. GUTHRIE AND L. COHEN.

1911 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in April, 1910.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follow:—

UNIT-VALUES of fertilising ingredients in different manures for 1911.

	Per unit. s.	d.
Nitrogen in nitrates ...	15	1
„ in ammonium salts ...	12	9
„ in blood, bones, offal, &c.—fine ...	15	0
Phosphoric acid in bones, offal, &c.—fine ...	3	0
Potash in sulphate of potash ..	5	2
Potash in muriate of potash ...	4	8
Phosphoric acid in superphosphate and mineral phosphate—		
Water-soluble ...	5	2
Insoluble ...	2	9

PRICE per lb. of fertilising ingredients in different manures for 1911.

	Pence per lb.
Nitrogen in nitrates ...	8·1
„ in ammonium salts ...	6·8
„ in blood, bones, offal, &c.—fine ...	8·0
Phosphoric acid in bones, offal, &c.—fine ...	1·6
Potash in sulphate of potash ..	2·8
Potash in muriate of potash ...	2·5
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble ...	2·8
Insoluble ...	1·5

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result

being the value of that substance in the ton of manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 x 15s. 0d.	=	£3 0s. 0d.	= value of the nitrogen per ton.
20 x 3s. 0d.	=	£3 0s. 0d.	= value of the phosphoric acid per ton
		£6 0s. 0d.	= value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood, and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term water-soluble phosphoric acid. When bones or mineral phosphates are acted on by sulphuric acid, a

portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

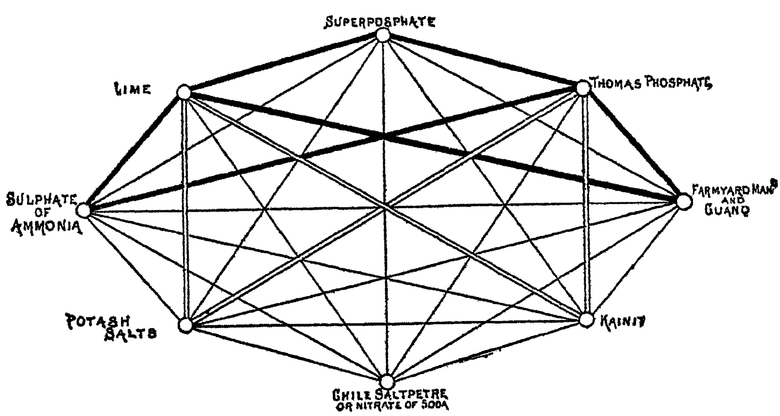
In the fourth table are a number of waste products which may in many cases be economically utilised.

WHEN purchasing a manure always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo. Buring in the *Garden and Field* of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

I.—Simple Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Equivalent to Ammonia.	Lime (CaO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).	Manurial Value. £ s. d.
Sulphate of ammonia	Australian Gaslight Co., Kent-street, and any manure merchant.	20·40	24·77	.. ...	.. ...	......	13 0 0
Nitrate of soda	Gibbs, Bright, & Co., 37, Pitt-street, and any manure merchant.	15·90	19·30	.....	......	......	12 0 0
Kainit	Potash Syndicate, and any manure merchant..	......	......	......	12·5	......	3 4 7
Muriate of potash	,, ,, ...	......	......	......	60 0	......	14 0 0
Sulphate of potash	,, ,, ...	......	.....	......	52·0	......	13 10 0
30 % potash manure	,, ,, ..	......	.....	......	30·0	......	7 0 0
Thomas' phosphate	Paton, Burns, & Co., corner of King and York streets.	......	.. ...	......	.....	18·0	......
Thomas' phosphate	A. H. Hasell, 2, Bridge-street	......	......	......	......	18·0	......
Building lime*	Sydney and North Sydney Lime and Cement Co., 17, Pitt-street,	......	......	95·0 (about).	......	......	......
Gypsum fertiliser*	A. H. Hasell, 2, Bridge-street	.. ...	......	98·0 Cryst. $CaSO_4$.	......	.. ..	......

* Lime and gypsum not guaranteed.

II.—Bone and Blood Manures.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	Manurial Value. £ s. d.
Special fertiliser, No. 3	Co-operative Wholesale Society, Alexandria	5·0	6·07	18·0	39·29	6 9 0
Bone-dust, No. 1	Paton, Burns, & Co., corner of King and York streets.	3·91	4·75	23·82	52·0	6 10 1
,, No. 2	,, ,, ,, ,,	3·91	4·75	23·82	52·0	6 10 1
Bone and blood, B.B.	,, ,, ,, ,,	5·5	6·68	18·0	39·29	6 16 6
Blood	,, ,, ,, ,,	10·7	13·0	....	....	8 0 6
Offal manure	,, ,, ,, ,,	6·82	8·0	....	....	5 2 4
Bone and blood manure	R. S. Lamb & Co., 55, Pitt-street	5·76	7·0	13·74	30·0	6 7 7
A 1 bone-dust...	,, ,, ,,	4·12	5·0	18·78	41·0	5 18 2
*** bone-dust	,, ,, ,,	3·91	4·75	23·82	52·0	6 10 1
Raw or green bone-dust	A. Wooster, Epping	4·01	4·86	24·41	53·3	6 13 5
Blood and bone-dust	,, ,,	5·76	7·0	13·74	30·0	6 7 7
Pure steamed bone-dust	,, ,,	3·91	4·75	24·50	53·5	6 12 2
Blood and bone manure	A. H. Hasell, 2, Bridge-street	5·5	6·68	18·0	39·29	6 16 6
Blood	,, ,,	13·17	15·99	....	....	9 17 6
Bone-dust	,, ,,	4·25	5·16	21·85	47·7	6 9 3
Bone-dust	I. Tester, O'Riordan-road, Alexandria	3·71	4·5	18·32	40·0	5 10 7
Blood and bone manure	Sydney Soap and Candle Co., Ltd., 365, Kent-st.	5·5	6·67	18·0	39·29	6 16 6
Bone and blood manure	J. Cooke and Co., Sandown, Granville	6·85	8·32	11·4	25·5	6 16 11
Bone-dust	Silvester Bros., Roberts-street, Enfield	3·99	4·84	21·98	47·98	6 6 0
Bone and blood manure	Jas. Barnes, Granville South	5·21	6·32	15·74	34·36	6 5 4
Blood	B. Richards & Sons, Ltd., Riverstone	13·36	16·23	....	....	10 0 5
Bone-dust	M. O'Riordan, O'Riordan-road, Alexandria	3·71	4·5	21·98	48·0	6 1 7
Bone-dust	M. Gearin, Gardener's-road, Botany	3·7	4·5	23·47	51·29	6 5 11
Bone and blood manure	Jas. Mackay, Enfield	6·16	7·48	13·59	29·67	6 13 2

III.—Superphosphates, Mixed Fertilisers, and Imported Fertilisers.

Manure	Where obtainable.	Guaranteed Composition. Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	Manurial Value. £ s. d.
Superphosphate, 36–38 per cent.	George Shirley, Limited, 279, George-street...	....	17·0	....	....	4 7 10
A1 Superphosphate ...	,, ,,	....	18·3	....	....	4 14 6
Superphosphate No. 3 ...	,, ,,	3·3	13 0	....	2·0	5 19 7
,, No. 5 ...	,, ,,	3·3	12·0	....	7·0	7 0 3
,, No. 7 ..	,, ,,	1·6	11·4	....	1·0	4 4 6
,, No. 11 ...	,, ,,	....	11·4	....	7·0	4 15 1
,, No. 18 ...	,, ,,	....	5·5	14·2	6·0	4 3 4
No. 1 Superphosphate ...	A. H. Hasell, 2, Bridge-street..	....	17·0	....	....	4 7 10
A1 Superphosphate ...	,, ,,	....	20 0	20·5	....	5 3 4
Nitro-superphosphate ...	,, ,,	1·35	15·44	19 05	....	5 6 10
Bone superphosphate ..	,, ,,	1·5	9·0	20 5	....	5 3 6
Marion Guano	,, ,,	....	....	31·0	....	4 5 3
Guano	Paton, Burns, & Co., corner of King and York streets	....	....	27·0	....	3 14 3
Superphosphate	,, ,,	....	17·0	....	....	4 7 10
No. 6. Potato Fertiliser ...	A. Wooster, Epping	4·52	....	14·91	5·0	6 18 5
No. 7. Complete Fertiliser.	,, ,,	5·01	....	14·56	2 0	6 9 2

IV.—Waste-Products, Ashes, &c., not on the Market.

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value.
										£ s. d.
Deposit from wool-scouring tanks. (1)	Liverpool Wool-scouring Works.	......	....	·64	·78	....	......	......	·72	0 13 3
" (2)	" " "	....	....	1·02	1·24	......	......	·16	·39	0 17 11
" (3)	" " "	....	....	1·37	1·66	....	......	·14	·20	1 1 11
Deposit from breakers	" " "	34·47		1·81	2·20	50·68	·85	·88	1·60	1 19 11
Sediment from wool-scouring works.	Yass	19·57		·59	·71	78·24	·97	....	·20	0 9 10
Scutch	Australian Glue-Gelatin Works, Alexandria.	56·98	......	2·95	3·58	....	4·56	None.	None	2 4 3
" from limed pelts	Hugh Wright, Auburn	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1 10 5
Decomposed hair and lime	Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	....	......	5 2 11
Tan-yard refuse	Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	26·96	·67	......	1 15 6
Tan refuse	....	7 10	50·90	2·62	3·18	16·03	18·58	·56	·18	2 1 11
Fleshings from tannery	....	·91	75·37	4·43	5·38	5·98	......	1·14	·04	3 9 10
Salt (sweepings from tannery)	....	3·04	....	·70	·85	·38	....	....	......	0 10 6
Wool-waste	....	....	....	8·15	9·89	....	......	......	......	6 2 3
"	....	34·33	28·20	1·97	2·39	26·03	2·75	·37	·32	1 10 8
Peat	H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	....	....	....	0 5 3
"	S. Cook, Pyrmont	49·51	34·63	·75	·91	....	....	·06	·01	0 11 3
Burnt peat	....	....	....	....	....	84·45	.. ..	·25	·33	0 2 6
Filter-press muck	Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13 20	5·98	·44	1 3 6
Megass	Clarence River cane	22·86	67·32	·63	78	8·61	·30	·01	·05	0 9 5
Megass ash	" "	....	....	....	......	87·69	3 07	·16	·51	0 3 0
"	Richmond River cane	....	....	....	....	....	1 11	·21	1·79	1 5 6
Bloodwood ash	....	....	....	....	....	....	8·47	·27	5·25	1 7 10
Ironbark ash	....	....	....	....	....	....	....	·82	1·53	0 10 3
Blackbutt ash	....	....	....	....	....	....	7·27	·04	2·02	0 10 7
Red-gum ash	....	....	....	....	....	....	......	·38	4·17	1 2 7
Spotted-gum ash	....	....	....	....	....	....	....	·10	70	0 3 11
Boxwood ash	....	....	....	....	....	....	....	·67	1·65	0 10 5
Grass-tree ash	....	·86	1·78	....	....	33·48	24·94	3·07	5·30	1 16 1
Vine-cuttings ash	....	·49	....	....	....	60·64	11·34	1·85	3·76	1 4 8
Red-apple ash	....	....	....	....	....	54·52	13·96	·47	6·00	1 12 4
She-oak ash	....	....	....	....	....	8·57	42·35	8·85	2·19	1 16 5
Hardwood ash	....	·50	1·35	....	....	62·38	13·50	1·76	3·09	1 1 3
Ash of wild melon	Stock Branch	....	....	....	....	....	5·12	4·85	27·08	7 14 5
Wood ashes	....	·30	....	....	....	21·43	41·37	·35	2·80	0 15 6
"	Wentworth Irrigation Area	....	....	....	....	11·12	50·78	·53	3·21	0 18 8
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	85	67·59	....	·28	·14	0 12 1

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value. £ s. d.
Clinker from locomotive boiler ..	....	....	....	....	....	....	....	....	·25	0 1 4
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·63	·54	·61	52 40	·64	·43	09	0 9 4
Sea-weed ash	....	....	....	....	....	....	9·27	·49	·59	0 4 7
"	....	....	....	....	....	....	6·29	1·27	17·55	4 11 4
"	....	·43	....	....	....	56·28	9·39	·47	2·26	0 13 1
"	Manly	....	....	....	....	43·06	6·52	·91	13·98	3 15 0
"	"	....	....	....	....	·07	·53	·19	34·30	8 17 9
"	Mr. Harvey, Department	3·25	19·46	....	....	61·63	4·22	·33	·22	0 2 1
Sea-weed, fresh state	....	80 00	....	·16	·19	....	·41	·09	1·18	0 8 6
Sea-weed	....	41·03	42·49	·14	·17	....	....	·21	60	0 5 10
Sea-weed, dried	....	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14	1 5 9
Air-slacked lime	....	16·58	....	....	....	1·88	75·44	....	....	....
Residue from calcium carbide ..	....	41·36	....	....	....	1·08	36·19	....	....	....
Limestone rock	Queanbeyan	1·10	....	....	....	4·70	48·20	1·22	....	0 3 4
Agricultural lime	Portland Cement Co. ..	18·43	....	....	....	23·80	Hydrate 13·80 Carbonate 43·97	....	....	....
Gypsum	Marulan	(Crystallised $CaSO_4$=92·64)				4·47	....	....	....	....
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2·11	....	·82	1·00	....	35·40	1·59	88	1 1 7
" "	Macleay River	23·06	16·01	2·43	2·95	26·77	13 88	7·40	....	2 18 8
Deposit (coral, shell, &c.)	Pacific Islands	2·13	13·53	·72	·87	....	44·00	3 53	·39	1 3 6
Shells..	Pambula River	....	....	....	....	....	44·59	·10	....	....
Flue deposit	Maitland	....	....	....	....	83·75	2·56	·32	·31	0 2 6
"	Liverpool	....	....	....	....	91·17	·42	1·29	·17	0 4 8
" from sanitary furnace	....	....	....	....	....	63·53	6·64	1·82	1·61	0 13 9
"	....	6·30	2·45	....	....	84·89	·32	·35	·38	0 2 10
Night-soil mixed with lime ..	....	44·33		·74	·89	18·60	7·62	·78	....	0 12 2
Night-soil	Wagga Wagga	6·70		·03	·04	82·19	·44	·28	·69	0 4 9
"	"	9·14		·28	·34	78·92	1·18	·18	·54	0 7 6
"	"	....		·50	·61	....	....	·64	·62	0 12 7
Night-soil preparation, No. 1 ..	....	8·22		3·73	4·63	50·22	13·32	9·65	·91	4 7 2
" " No. 2 ..	....	7·20		1·83	2·22	29·02	8·05	4·10	·15	1 19 5
" " No. 3 ..	....	25·95		1·64	1·99	60·17	1·39	1·61	·70	1 12 11
" preparation, "Pinhoe" manure.	....	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 9 7
Night-soil preparation	F. Artlett, Parramatta ..	7·33	30·06	2·10	2·55	46·38	2·09	1·92	·61	2 0 5
" "	" " ..	10·11	42·59	4·97	6·03	·94	30·12	·39	....	3 15 9
" "	Mr. Halstead, O'Brien's patent.	1·54	12·36	·54	65	77·95	....	·63	....	0 10 0
" "	....	29·52	56·15	2·55	3·10	14·33 (ash).	....	....	....	1 18 3

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Manurial Value.
										£ s. d.
Farmyard manure	...	67·96	22·09	·40	·49	8·16	·16	·20	·30	0 8 1
Stable manure	Bathurst	39·26	...	·41	·50	...	...	·27	·67	0 10 5
Fowl manure	...	3·95	16·48	1·47	1·78	70·16	2·10	1·94	...	1 7 10
"	...	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 16 5
Sheep manure	Bathurst	7·73	...	1·06	1·30	...	...	·69	1·17	1 4 0
"	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2·00	·91	·92	1 14 4
Sheep dag	...	...	...	3·04	3·69	...	...	...	...	2 5 7
Refuse manure	Abattoirs	12·00	74·51	4·14	5·03	6·56	...	1·80	...	3 7 6
Flying-fox manure	...	1·09	35·34	3·34	4·05	50·29	1·02	·36	1·15	2 17 1
Fish fertiliser	...	14·47	64·36	10·37	12·59	4·52	...	...	...	7 15 6
Shark fertiliser	...	9·02	68·04	10·59	12·85	3·86	...	7·27	...	9 0 8
Fish manure	...	10·88	59·26	6·10	7·40	5·39	9·82	8·28	...	5 16 4
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	...	...	...	10 10 5
" short	" "	9·72	87·76	14·00	17·00	2·82 (ash).	...	...	...	10 10 0
Bat-guano	...	14·11	17·69	1·55	1·88	28·77	13·72	11·42	...	2 17 6
"	...	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15	2 5 1
"	...	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace.	5 10 6
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	·61	57·64	5·60	12·12	...	2 3 10
Guano deposit	Tamworth	8·75	38·40	6·17	7·49	12·85	...	9·24	...	6 0 3
" "	"	8·42	20·97	3·10	3·76	31·89	...	7·87	...	3 10 1
" "	"	14·55	29·91	3·66	4·44	15·81	...	12·98	...	4 13 10
" "	"	9·35	44·32	6·73	8·17	7·33	...	13·17	...	7 0 5
Bone breccia	Queanbeyan	5·71	...	·59	·72	9·48	42·80	3·11	...	0 18 2
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60	0 15 1
Muck raked from waterhole	...	63 66	29·86	·81	·98	3·80	·96	·10	·06	0 12 9
Sawdust	...	32·52	62·35	·82	1·00	...	...	1·70	·05	0 17 6
Decayed wood, bark and leaves, bloodwood.	...	57·80		·74	·89	40·68	1·30	...	...	0 11 1
Decayed wood, bark and leaves, pepper-tree.	...	79·92		·89	1·08	17·77	1·50	...	...	0 13 4
Coco-nut oil cake	...	8·24	...	3·29	3·99	...	...	1·20	1·49	3 0 7
Castor cake	...	18·81	74·08	4·30	5·22	...	...	1·83	·86	3 14 5
Pea cake	Java	16·02	...	7·24	8·79	...	...	1·46	1·17	5 19 0
Bean cake	North China	14·52	80·32	6·77	8·22	...	...	1·33	1·99	5 15 9
Rice husks	...	42·74	42·15	1·07	1·30	13·77	·02	·03	·04	0 16 4
Field pea, whole plant	...	88·58	9·97	·55	·67	...	·15	·12	·49	0 11 2
Tares, whole plant	...	83·97	14·96	·73	·88	...	...	·11	·21	0 12 5
Marsh mallow, whole plant	...	79·00	17·86	·85	1·03	...	...	·14	·69	0 16 9
Horse bean, leaves and stalks	...	82·87	15·90	·90	1·09	...	·05	·11	·54	0 16 7

Field Experiments with Wheat

GEO. L. SUTTON, Wheat Experimentalist.

In February *Gazette* the purpose and scope of these experiments were explained, and the results at Cowra Experiment Farm were given by Mr. F. Ditzell, Experimentalist of that Farm. In this issue Mr. H. J. Kelly, late Foreman at Coolabah Farm (now Foreman at Nyngan), gives details of the work and results at Coolabah for the years 1907 to 1909. Experiments were not carried out there during 1910, as the operations had then been transferred to Nyngan. Coolabah was utilised by the Department as the station for experimenting for the dry and hot districts beyond the recognised wheat zone, but the location of the farm was found to be too inaccessible for most efficient work; hence the transfer to Nyngan.

In last issue the method and purpose of calculating the "Natural" and "Percentage" yields, so as to render the results comparable, were fully explained.

TILLAGE EXPERIMENTS WITH THE PLOUGH, COOLABAH EXPERIMENT FARM.

H. J. KELLY.

The experiments occupied three blocks, G, H, and J, each consisting of twenty-two plots, three of which were buffer plots and not required for the purposes of comparison. Each of these blocks was cropped in accordance with the following rotation:—

Wheat,
Fodder Crop,
Fallow.

The rotation was so arranged that one of the blocks was always under wheat, ploughed and planted in accordance with the plan shown on page 256.

Prior to the commencement of the experiment, the three blocks had been cropped in a similar manner. In the year preceding the commencement of the experiment the three blocks had been planted with Black Cowpeas, which made a satisfactory growth. For five years preceding the cropping with cowpeas, the land had been cropped irregularly with different varieties of wheat. After the experiment was started, the cropping of the blocks was as follows:—

	G.	H.	J.
1907.	Wheat.	Cowpeas.	Fallow.
1908.	Cowpeas and Rape.	Fallow.	Wheat.
1909.	Fallow.	Wheat.	Rape.

From the above it will be seen that the experiment was not planted twice in the same ground.

The variety of wheat used each year was Steinwedel, and was sown uniformly at the rate of 30 lb. per acre. The results were largely interfered with by the irregularities and inequalities of the soil. Numerous bare and barren patches were found amongst the plots. It was noticed that in the fertilised plots these "bare patches" were less frequent than on the non-fertilised ones.

The portion harvested for comparison was one-twentieth of an acre.

The crop was cut just after flowering for hay-making purposes, and the weights given are those of the greenstuff weighed immediately it was harvested. It was considered that a better comparison was obtainable at this stage than later. From other data available it is estimated that the greenstuff would produce from one-third to half its weight of hay. The yields given in the following tables have been computed from the actual weights obtained from the plots.

Ploughs Used.

The ploughs used were a 4-furrow Spalding-Robbins disc plough, and a 3-furrow Fysh mould-board plough. The subsoiling was done by means of a single-furrow Ransome plough, followed by a King subsoil plough.

Results.

The yields from the various plots are given in Table I, shown as "actual," "natural," and "percentage" yields, as well as the average yields up to and including the particular year. Tables II, III, and IV then give the results collected in such a way as to show the contrasts, to obtain which the experiments were conducted.

22	In 1908-9 a portion of this plot was trenched 24 inches deep. Disc plough, 6 inches deep.		Fertiliser.
21	**Check Plot.**—Disc plough, 6 inches deep		Fertiliser.
20	,, ,, 8 ,,	These plots were to have been subsoiled.	No Fertiliser.
19	,, ,, 8 ,,		Fertiliser.
18	Mould-board plough, 8 inches deep, and subsoiled ..		No Fertiliser,
17	,, ,, 8 ,, ,, ..		Fertiliser.
16	**Check Plot.**—Disc plough, 6 inches deep		,,
15	Mould-board plough, 8 inches deep		No Fertiliser.
14	,, ,, 8 ,, ...		Fertiliser.
13	**Check Plot.**—Disc plough, 6 inches deep		,,
12	,, 8 ,, ...		No Fertiliser.
11	,, 8 ,, ...		Fertiliser.
10	Mould-board plough, 6 inches deep		No Fertiliser.
9	,, ,, 6 ,, ...		Fertiliser.
8	**Check Plot.**—Disc plough, 6 inches deep		,,
7	Mould-board plough, 4 inches deep		No Fertiliser.
6	,, ,, 4 ,, ...		Fertiliser.
5	Disc plough, 4 inches deep		No Fertiliser
4	,, 4 ,, ...		Fertiliser.
3	**Check Plot.**—Disc plough, 6 inches deep		,,
2	,, 6 ,, ... No Fertiliser.	Buffer plot	Results not used for comparison.
1	,, 6 ,, ... Fertiliser	,,	

Sketch showing arrangement of plots in ploughing experiments, Coolabah Experiment Farm, as carried out 1907–8–9. Width of ordinary plots, 27½ links. Width of check plots, 55 links. Length of plots, 678 links.

TABLE I.—Results of Ploughing Experiments, at Coolabah Experiment Farm, 1907-8-9.
Blocks harvested—1907, G; 1908, J; 1909, H.

Plots.	Variety.	Treatment of Plot.	1907—Yield. Per acre. Computed lb.	1907—Yield. Per acre. Average lb.	1907—Yield. Natural. lb.	1907—Yield. Percentage. Yearly.	1907—Yield. Percentage. Average.	1908—Yield. Per acre. Computed lb.	1908—Yield. Per acre. Average lb.	1908—Yield. Natural. lb.	1908—Yield. Percentage. Yearly.	1908—Yield. Percentage. Average.	1909—Yield. Per acre. Computed lb.	1909—Yield. Per acre. Average lb.	1909—Yield. Natural. lb.	1909—Yield. Percentage. Yearly.	1909—Yield. Percentage. Average.
3	Steinwedel.	**Check.** Disc 6 inches, fertilised	2,810	2,810	2,810	100·00	100·00	9,190	6,000	9,190	100·00	100 00	12,365	8,121·7	12,365	100·00	100·00
4	„	„ 4 „ „	2,840	2,840	2,880	98·61	98·61	9,920	6,380	9,308	106 57	102·59	11,780	8,180	12,335	95·50	100 20
5	„	„ 4 „ not fertilised	2,683	2,683	2,950	90·95	90·95	7,580	5,131·5	9,426	80·40	85·67	8,460	6,241	12,305	68·75	80·00
6	„	Mould-board, 4 inches, fertilised ..	3,150	3,150	3,020	104·34	104·34	7,860	5,505	9,544	82·35	93·34	11,390	7,466·7	12,275	92·79	93 16
7	„	„ 4 „ not fertilised ..	2,264	2,264	3,090	73·27	73·27	7,240	4,752	9,662	74·93	74·10	7,620	5,708	12,245	62·23	70·14
8	„	**Check.** Disc, 6 inches, fertilised	3,160	3,160	3,160	100·00	100 00	9,780	6,470	9,780	100 00	100·00	12,215	8,385	12,215	100·00	100·00
9	„	Mould-board, 6 inches, fertilised ..	3,250	3,250	3,200	101·56	101·56	10,320	6,785	9,840	104·87	103·21	12,620	8,730	12,489	101·05	102·49
10	„	„ 6 „ not fertilised ..	2,640	2,640	3,240	81·48	81·48	10,280	6,460	9,900	103·94	92 71	9,400	7,440	12,763	73 65	86 35
11	„	Disc, 8 inches, fertilised	3,161	3,161	3,280	96·37	96·37	10,600	6,880·5	9,960	106·42	101·39	14,460	9,407	13,037	110 91	101·51
12	„	„ 8 „ not fertilised	2,291	2,291	3,320	69 00	69·00	10,080	5,545·5	10,020	87·82	78·41	10,190	7,093·7	13,311	76 55	77·79
13	„	**Check.** „ 6 „ fertilised	3,360	3,360	3,360	100·00	100·00	8,800	6,720	10,080	100·00	100·00	13,585	9 008·3	13,585	100 00	100·00
14	„	Mould-board, 8 inches, fertilised ..	3,070	3,070	3,423·3	89·68	89·68	10,000	6,535	10,316 7	96 93	93·30	12,050	8,373·3	13,005	92·65	93 08
15	„	„ 8 „ not fertilised ..	3,240	3,240	3,486·6	92·92	92 92	8,820	6,030	10,553·4	83·57	88·24	9,740	7,266·7	12,425	78 39	84·96
16	„	**Check.** Disc, 6 inches, fertilised	3,550	3,550	3,550	100 00	100·00	10,790	7,170	10,790	100·00	100 00	11,845	8,728·3	11,845	100·00	100 00
17	„	Mould-board, 8 inches, and subsoiled, fertilised.	4,100	4,100	3,762	108·98	108·98	10,860	7,480	10,400	104·42	106·70	12,800	9,253·3	11,821	108·28	107·22
18	„	Mould-board, 8 „ subsoiled, not fertilised.	4,060	4,060	3,974	102·16	102·16	7,960	6,010	10,010	79·52	90 89	10,500	7,506·7	11,797	89·00	90·22
19	„	Disc, 8 inches, fertilised	4,440	4,440	4,186	106·06	106 06	9,540	6,990	9,620	99·16	102·61	13,520	9,166·7	11,773	114·83	106·68
20	„	„ 8 „ not fertilised	3,620	3,620	4,398	82·31	82·31	8,020	5,820	9,230	86·89	84 60	7,780	6,473·3	11,749	66·21	78·47
21	„	**Check.** „ 6 „ fertilised	4,610	4,600	4,610	100·00	100·00	8,840	6,725	8,840	100 00	100·00	11,725	8,391·7	11,725	100·00	100·00
22	„	„ 6 „ and trenched 24 inches deep, fertilised.	..	..	..	..	..	11,480	11,480	8,450	135·86	135·86	11,680	11,580	11,701	99 82	117·84

In order to have results that are comparable, the yields of the several depths given in Tables II and III are those of the fertilised plots. The average of the fertilised and unfertilised plots could not be taken, for there were no unfertilised plots disc-ploughed 6 inches deep. To take an average of the fertilised and unfertilised plots at other depths, and compare these average results with the results of the fertilised plots disc-ploughed 6 inches deep, would be misleading.

TABLE II.—*Coolabah.*—Variations due to Type of Plough used.

		1907.	1908.	1909.	Average.
Ploughed 4 inches deep.	Disc plough	98·61	106·57	95·50	100·20
	Mould-board plough ...	104·34	82·35	92·79	93·16
Ploughed 6 inches deep.	Disc plough	100·00	100·00	100·00	100·00
	Mould-board plough...	101·56	104·87	101·05	102·49
Ploughed 8 inches deep.	Disc plough	101·21	102·79	112·87	105·62
	Mould-board plough...	89·68	96·93	92·65	93·08

Except in indicating that for deep ploughing the disc plough is preferable to the mould-board, these results are not consistent enough to be conclusive. They indicate, however, that unless the ploughing is to be deeper than 6 inches, either plough can be used without loss.

TABLE III.—*Coolabah.*—Variations due to Depth of Ploughing.

	1907.	1908.	1909.	Average.
WITH DISC PLOUGH.				
4 inches	98·61	106·57	95·50	100·20
6 "	100·00	100·00	100·00	100·00
8 "	101·21	102·79	112·87	105·62
Trenched and ploughed 6 inches deep...	......	105·86	99·82	117·84
WITH MOULD-BOARD PLOUGH.				
4 inches	104·34	82·35	92·79	93·16
6 "	101·56	104·87	101·05	102·49
8 "	89·68	96·93	92·65	93·08
8 " and subsoiled	108·98	104·42	108·28	107·22

The results indicate that when the disc plough is used, deep ploughing is not injurious, and that slightly the best results are obtained when the ploughing is deepest. When the mould-board plough is used, it seems advisable not to plough deeper than 6 inches. Ploughing 8 inches deep with the mould-board seems to be detrimental to the yield, a result different to that obtained with the disc plough. As the mould-board plough inverts the ploughed soil, whilst the disc plough hardly alters the relative position of the different layers of soil, a probable explanation of this difference is that it may be due to the character of the work which the respective ploughs perform.

Ploughing with the mould-board 8 inches deep seems to be detrimental to the yield; yet in seeming contradiction to this, when the 8-inch ploughing was further deepened by subsoiling, it gave consistently increased returns. A probable explanation is that the benefits of subsoiling, in the direction of storing moisture, outweigh the disadvantages of the deep ploughing with the

mould-board plough. Possibly the increase due to subsoiling would have been still greater had the ploughing been less deep or done with the disc.

The results from trenching are conflicting, and because they relate only to a very brief period are quite inconclusive.

TABLE IV.—*Coolabah.*—Variations due to the application of a Fertiliser.

Depth of Ploughing, &c.		1907.	1908.	1909.	Average.
Disc ...	4 inches, with fertiliser ...	98·61	106·57	95·50	100·20
	4 ,, without ,, ...	90·95	80·40	68·75	80·00
Mould-board.	4 inches, with fertiliser ...	104 34	82·35	92·79	93·16
	4 ,, without ,, ...	73·27	74 93	62·23	70·14
Disc ...	6 inches, with fertiliser ...	100·00	100·00	100·00	100·00
	6 ,, without ,, ...	...	...	...	...
Mould-board.	6 inches, with fertiliser ...	101·56	104·87	101·05	102·49
	6 ,, without ,, ...	81·48	103·94	73·65	86·35
Disc ...	8 inches, with fertiliser ...	101·21	102·79	112·87	105·62
	8 ,, without ,, ...	75·65	87·35	71·38	78·12
Mould-board.	8 inches, with fertiliser ...	89·68	96·93	92 65	93·08
	8 ,, without ,, ...	92·92	83·57	78·39	84·96
Mould-board, 8 in., and subsoiled.	with fertiliser ...	108·98	104·42	108·28	107·22
	without ,, ...	102·16	79·52	89·00	90·22

The results, with one exception, viz., mould-board ploughing 8 inches deep in 1907, are consistently and strongly in favour of the direct application of fertiliser.

TABLE V.—Rainfall at Coolabah, 1907–9 (in points).

Year.	Month.												Total for Year.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Inches.
1907	516	9	271	30	3	119	67	99	14	31	174	256	16·09
1908	27	285	5	182	63	41	186	179	19	86	130	96	12·99
1909	297	307	114	57	54	246	52	280	23	26	89	159	17·04

CONCLUSIONS.

From the results obtained at both Farms, and pending additional results of further experiments (for this work has only passed the preliminary stage), it may tentatively be concluded that:—

(1) For breaking new land, that is not to be fallowed, or for ploughing-in weed growth just prior to planting, the mould-board plough is to be preferred to the disc.

(2) Deep ploughing (8 inches) with the disc is not injurious. Under some conditions deep ploughing with the mould-board may be detrimental to the yield.

(3) There is so little difference in the results from the several depths ploughed, that it seems likely that it is more important to plough thoroughly than deeply. Five to 6 inches may be considered the most satisfactory depth to use in practice.

(4) The results from subsoiling are variable. In the drier districts, and on the heavier soils as at Coolabah, it is likely to prove beneficial.

(5) As under some conditions the direct application of fertiliser proves extremely beneficial, it is advisable, until the factors governing these conditions are understood, to apply fertiliser directly with all wheat crops, unless experiments have shown such application to be unnecessary.

Influencing or Controlling Sex in Poultry.

G. BRADSHAW.

WITH almost every daily and weekly newspaper in the State, and specialist papers as well, devoting portion of their space to the culture of the hen, it is amazing the amount of ignorance of even otherwise well-informed people which prevails on the subject. An article in January *Gazette* showed that quite a number of poultry-breeders believed that a little mechanical device could really not only tell whether an egg was fertile, but also whether a male or female chick was contained within the shell. Ordinarily the subject would have received no further attention from the writer, but for the following circumstance, which is further testimony to the very crude ideas entertained by some people on the sexual laws governing the breeding of fowls.

On one of the closing days of the past year a letter reached the Department of Agriculture from a resident within 100 miles of Sydney, the request being to send him a dozen fertile Buff Orpington eggs. Assuming that the Department did deal out eggs from its Bridge-street building, the absurdity of the order will be apparent. No one can tell what is within the shell of an egg. If hens have been cooped up for months, with no chance of a male bird having access to them, the eggs will be what is known to breeders as "clear," *i.e.*, infertile. On the other hand, if a rooster of the most healthy and virile sort and a number of healthy hens are mated and kept under the most favourable circumstances, fertile eggs are expected to result; but no breeder could guarantee any twelve eggs from the hens fertile. There are some mated hens which never lay a fertile egg, and there are hens in many flocks which the male bird will not mate with, their eggs being thus infertile; hence the foolishness of the applicant's request.

This, however, was a simple absurdity in comparison with the other one which accompanied it. Of the twelve chickens which were expected to evolve from the eggs, the correspondent requested that three of them should be cockerels and nine pullets. Many readers no doubt will be inclined to think the applicant was having some jest with the Department. This, however, was not so, for he enclosed a post office order in his letter to pay for the eggs.

Further comment is needless, except to say that despite all the plainly languaged pamphlets, bulletins, and other literature issued free by the Department of Agriculture, other questions almost as absurd are regularly received.

Very many papers have been written within the past and present century upon the possibility of producing a preponderance of either sex of our domestic fowls. Almost every poultry book has something to say on the matter, and

there is not a doubt but that it would be a great advantage to many poultry-breeders could they mate their fowls in such a way as to control the number of cockerels. Breeding table poultry in England pays better than egg-farming, so the Englishman could then arrange for the majority of his eggs to produce male birds; while here in Australia, as eggs are the most profitable side of the industry, the thousands of little Leghorn cockerels which flood the market would be a thing of the past. But whether in England, here, or elsewhere, could it be done, poultry breeders would welcome any practical scheme which would even give approximate desired results.

It is accepted by many poultrymen that the early hatches of the season produce a preponderance of cockerels. The cause alleged is that the male birds were then more vigorous than at the close of the breeding season, when the pullets are in the majority. On the other hand, there are some present-day breeders who have put the above theory to test, by actually noting results, and from their experience no definite conclusion could be arrived at.

An experience of the writer during the present season may be given. From three broods, two hatched in July and one in August, thirty-three chickens were reared; eighteen turned out pullets, and fifteen cockerels, results which prove nothing.

Some breeders declare that young cockerels mated with three-year-old hens will produce most cockerels. When put to the test, some broods supported the theory, others gave evidence to the contrary. One suburban poultry breeder says, when he wants plenty of cockerels he mates a very old but vigorous male bird with his hens. Again, it is said that inbred fowls are to be relied on to produce most pullets, while some breeders assert that if the sexes of the breeding pen are entirely unrelated the cockerels will be in the majority.

An American authority is emphatic on the subject, as follows:—

> The sex we desire to preponderate should be represented in the breeding pen by the most vigorous parent. When pullets are desired, it will be well to see that the hens are quite as young and vigorous as the male bird, and if cockerels are desired to be in the majority, that can be brought about by mating older hens with a cockerel. When the male has become debilitated by long service, pullets will preponderate.

In contradistinction to the above, some of the old English gamecock breeders state as a fact, that strains in which cockerels preponderate are the strains that produce the most courageous stock.

In a number of the *Popular Science Monthly*, Professor T. H. Morgan has a paper on "Recent Theories in regard to the Determination of Sex"; but there is really not much in it which is new to students of poultry. Mention is made of announcements from time to time of discoveries of the principle of sex, or of a rule for its control, but these people are very rarely heard of after what little excitement the announcement may have produced has died away. The Professor's experiments were mostly made with frogs and other lower animal life, and it cannot be said that his article offers much hope of an early realisation of definiteness on the question. Indeed, the conclusions are that we are not so near the solution of the problem as we thought we were.

Returning, however, to the subject of selection, it will be found that some hens will lay eggs that will produce all, or nearly all, cockerels, or all, or nearly all, pullets. This takes place among other animals and human beings. We know that there are animals that give birth to males only, and there are others that produce females only, and the same thing takes place frequently in the human family; but, taken all in all, it will be found whether the stock be feathered or quadruped, no matter how selected or by what system the selection is put into effect, from a given number in a given time the sexes will be approximately equal. At the same time, for any poultry-keeper who has time and enthusiasm enough, there is a great field for investigation in influencing sex; but whether an unhatched fertile egg, or unborn animal is to be a male or female, will providentially remain one of Nature's most profound secrets.

Formalin for Potato Scab.

Mr. W. Lennox, President, Millthorpe Branch, Farmers and Settlers' Association, writes:—

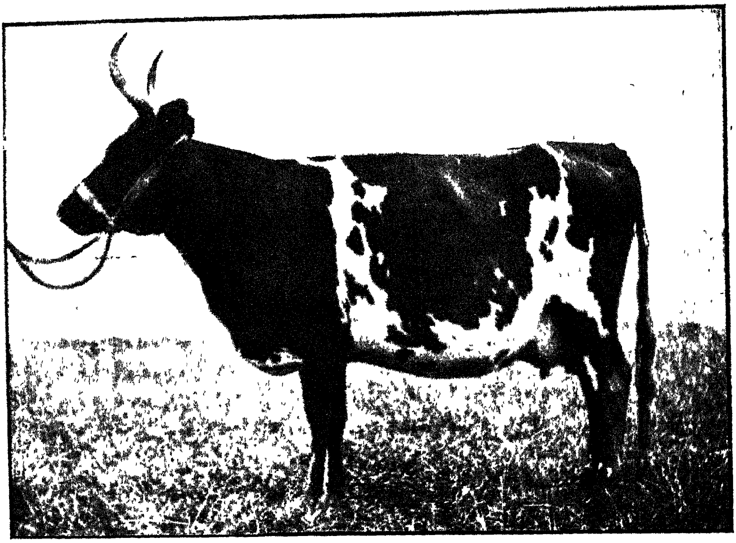
It is fifteen years since I came to the Millthorpe district and started to grow potatoes. The land I settled on had previously been very little used for potato-growing, and up till the year 1902 the scab was almost unknown to me. It was just noticeable by small specks making their appearance on the skin of the tubers; but it kept on getting worse, until our potato crops for the last five or six years have been in a very bad state, many of the tubers not being marketable. None of our growers seemed to know what it was, or the cause of it.

In 1909, the Agricultural Department took the matter up and sent Mr. M. H. Reynolds, Inspector of Agriculture, into the Orange and Millthorpe districts. Mr. Reynolds worked hard and took every opportunity to enlighten farmers as to the treatment of their seed potatoes. He advocated dipping the seed in a solution of 1 pint of formalin to 30 gallons of water, and I think that those who followed his instructions were quite satisfied with the result.

Some seem to think that the formalin injures the eyes and has a bad effect on the potatoes germinating, but this is not my experience, although my seed was just double the prescribed time in the solution, which was two hours. I used a 400-gallon wooden tank made for the purpose of dipping the seed. I put four sacks into the solution before going to work in the morning, and took them out when I returned at dinner-time, allowed them time to drain, and stood the sacks up in an airy shed to dry. I put in four more after dinner, and took them out when I returned at night, and so on until the whole of my seed was treated.

Some of these potatoes were treated three weeks before being planted, and I am satisfied by the rapid growth the sets made in the bags that the formalin did not in any way injure them. When the crop came up there were a good many misses, but this I expected, and I am satisfied that in any dry year when grubs make a raid on the potato crop we will have the same thing. Last year grubs were bad in this district, and I am quite convinced, by examination of the seed before planting, that the ravages of grubs, and not formalin, were responsible for the crop not coming up as it should have done. This crop when dug was in a very satisfactory condition. Although not absolutely free from scab, they were affected in very slight degree. I had about 3 acres of self-sown potatoes in the same paddock which I dug, and am convinced, by the marked difference in the two samples, that the formalin had a good effect.

I am of opinion that, for the benefit of our potato-growers, our Honorable Minister should have exhaustive experiments carried out in the treatment of potatoes for scab.



Juliette. Dam, Judy IX of Barcheskie (imp.); sire, Mischiefmaker (imp.).
A good dairy Ayrshire.

Julia. Dam, Juliette; sire, Peacemaker. Colour, dark brown and little white.
A handsome cow and a good one.

AYRSHIRES AT BERRY STUD FARM.

Ayrshires on the Berry Stud Farm.

M. A. O'CALLAGHAN.

THE State Stud Farm, established twelve years ago, has been during the last eleven years situated close to the town of Berry. It consists of about 350 acres of land of various qualities. Some portions are rich flats, others consist of medium quality hilly land, while some of the flats away from the river bank are of a black soil, somewhat clayey in character; but, taking it all round, it may be stated to be suitable for the purpose for which it has been used. Ayrshire cattle have done extremely well on the farm, and not only have large milkers been produced, but a number of the animals are very true to type, and the size has been well maintained.

The Mischiefmaker Strain.

When the two bulls, Daniel and Mischiefmaker, were imported, most Ayrshire judges preferred the former as a bull more likely to beget large milk-yielding progeny. Mischiefmaker was, however, selected by me as the one to use on the State Stud Farm, and the results have been more than satisfactory; in fact, Mischiefmaker never got a bad milk-yielding heifer, and two of his sons also proved the sires of deep milkers. There were only six imported Ayrshire cows in the herd when it was first founded, so that the bull did not get a great opportunity.

The following are some of his progeny:—

The Mischiefmaker–Primrose Family.

From the same herd in Scotland came two beautiful cows, Primrose and Roseleaf of Barcheskie; and with them Mischiefmaker of Barcheskie.

From Primrose, mated with Mischiefmaker, was obtained that exceptionally beautiful cow Miss Prim, for which an offer of 100 guineas was refused when she was but eighteen months old. A photograph of Miss Prim is given here. She has a grand Ayrshire head, and is of great length, with a deeply-sprung rib and excellent hindquarters. Many visitors from Scotland and elsewhere have seen this cow and her daughter, Primrose II, and the general opinion has been that a finer pair of Ayrshires would be difficult to find.

Miss Prim comes of a great prize-taking family, her sire having won numerous first prizes, including first at Kilmarnock in 1897; and her grandsire on the dam's side was the famous bull Royal Stuart of Glenbuck, who, after winning all over Scotland (including first at the show of the Highland and Agricultural Society of Scotland), was sold for £200. Miss Prim is a very heavy milker, and is giving 4 gallons a day at present.

Primrose II, by General from Miss Prim, is, if anything, a handsomer cow than her mother; and Mr. Dunlop, the well-known Scotch judge of Ayrshires, when visiting Australia recently as a member of the Scotch Commission, was loud in his praise of this grand young cow. Unless one took exception to her light colour, it would be difficult to find a fault in her. Her lines are truly classical, and her symmetry is superb. Personally, I consider her the most graceful-looking Ayrshire cow I have ever seen. She has great length, but her proportions are so symmetrical that her unusual length only adds grace to her outline. The head is alert and intelligent-looking—that is, if a cow can ever be said to be intelligent-looking; the neck tapers beautifully and fits into the shoulder without the suspicion of a hollow. The chine is just a little higher than the line of the neck, and the back is about as level as it is possible to get, with just the correct elevation over the pelvic cavity. From the hip to the setting on of the tail is of a nice length, and the breadth across the hips is just what a breeding cow requires. The tail is of excellent length and is well set on. The udder is capacious, evenly balanced, and set off with four good teats of a nice length.

The Mischiefmaker–Roseleaf Family.

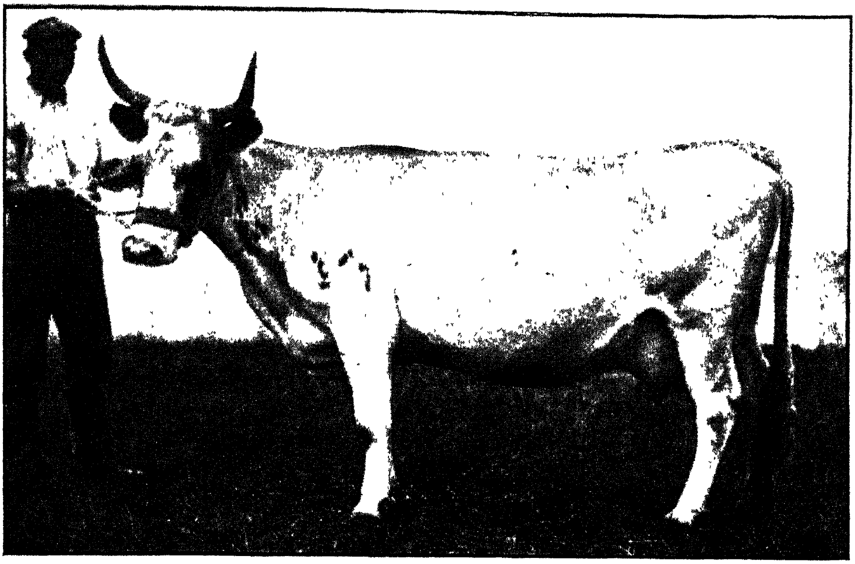
To Mischiefmaker, Roseleaf threw that great dairy cow Rose Berry, and from Rose Berry some excellent young cows and bulls have sprung, including the beautiful heifer Ripple Rose, whose photograph is given; also that good cow Rose Flower, which will be illustrated later on. The excellent young Ayrshire bull, Dan of the Roses, now stationed at the Hawkesbury Agricultural College, is also of this family.

The year after she arrived from Scotland, Roseleaf yielded over 600 gallons of milk, and her daughter, Rose Berry, on her first calf, gave 577 gallons of milk, with an average fat test of 4·1 per cent. It is a fact worthy of note, that whereas Mischiefmaker and Roseleaf were both light-coloured animals, their daughter, Rose Berry, has a good deal of brown in her colour, while the grand-daughter, Ripple Rose, by another light-coloured bull, Prince Emerald (imp.), is dark red and white in colour; and Dan of the Roses is of a dark brown, with very little white.

The Mischiefmaker–Judy Family.

This is another excellent family of Ayrshires, and one of somewhat different type to the two previous ones. The animals of this strain are of the short, compact, thick-set type. In colour most members of the family are dark brown and white, though the original imported cow—Judy IX—was principally of a white colour with brown markings. An excellent producing strain of Ayrshires, as the records on ordinary grass pasture show.

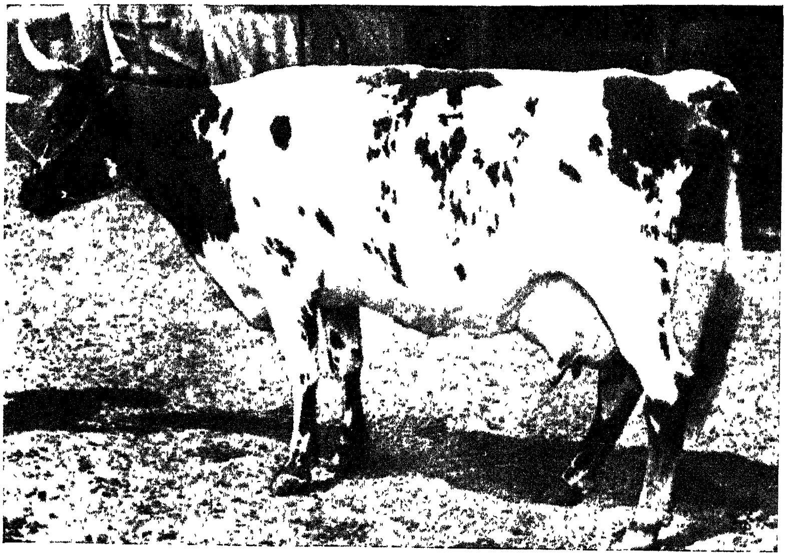
Judy IX gave 703 gallons of milk, with an average fat test of 3·7 per cent.; her daughter, Kirkham Judy, on her second calf, gave 540 gallons of milk, with a fat test of 4·1 per cent. Her second daughter, by Mischiefmaker, named Juliette, is, however, a better cow, and the photograph given shows that she is of a hardy, strongly constituted type, a little short in the neck,



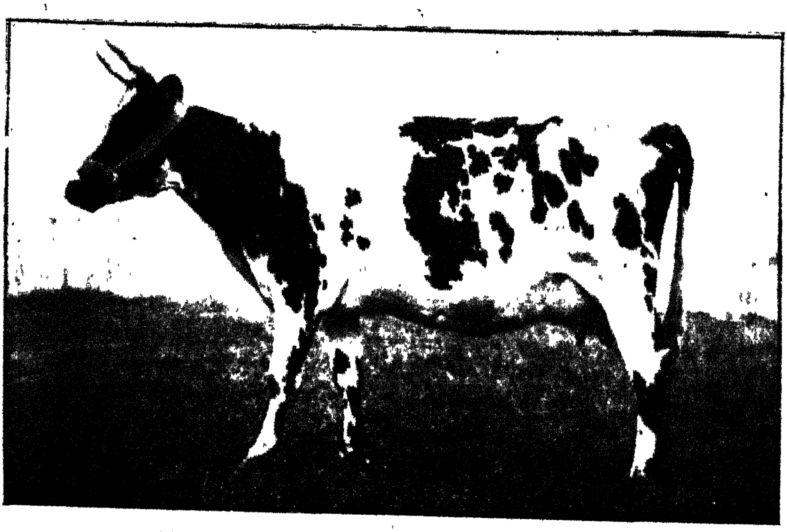
Miss Prim. Dam, Primrose of Barcheskie (imp.); sire, Mischiefmaker (imp.).
Now an old cow, and a very heavy producer. Note the typical face of this cow.

Primrose II. Dam, Miss Prim; sire, General.
Advanced in milk when photo. was taken. A good producer.

AYRSHIRES AT BERRY STUD FARM.



Rose Berry. Sire, Mischiefmaker (imp.); dam, Roseleaf (imp.).
Now an old cow. Has been a great producer.



Ripple Rose. Dam, Rose Berry; sire, Prince Emerald (imp.)
Ripple Rose—colour, red and white; a promising young cow.

AYRSHIRES AT BERRY STUD FARM.

but with a first-class head and horns. On her first calf this cow gave 203 lb. of butter in a milking period of forty-two weeks.

Julia, by Peacemaker (a son of Mischiefmaker) from Juliette, is a young cow of great promise, and somewhat handsomer in shape than her mother. It will be seen that she has a double cross of Mischiefmaker blood in her, and is, therefore, somewhat inbred. Her top line is very excellent, and a good spinal column ends with a long tapering tail, beautifully set on. The hindquarters are flat and very incurving, and the flanks are highly arched and thin. The udder is evenly balanced and excellent in shape, with a set of four teats of good length and colour. She takes more after what I consider the best type of colonial Ayrshire, rather than the Scotch. She had been some time in milk when this photograph was taken, while her dam, Juliette, was nearly dry when the photograph given herewith was taken.

A beautiful young bull, Romeo, is also of this family.

As Mischiefmaker has produced these three first-class families of Ayrshires, it might be well to give his pedigree for breeding reference.

Mischiefmaker of Barcheskie; born April, 1895; by Duke of York of Hillhouse (2,864), from May Mischief of Barcheskie.

The sire of Mischiefmaker, Duke of York of Hillhouse, gained several first prizes and medals in 1893 and 1894; while May Mischief was also a noted winner, gaining, among other awards, first at the Highland and Agricultural Society's Show, Aberdeen, 1894, and second in the milking competition at Castle Douglas in 1898.

Orchard Notes.

W. J. ALLEN.

March.

Owing to the continuous rains which have been falling during the last two months, the numerous orchards throughout the State never looked better. Both old and young citrus trees have put on splendid growth, and the trees look the picture of health.

Growers are still busy marketing their fruit, which, with the cultivation of the orchards and picking up and destroying diseased fruit, in accordance with the regulations under the Fruit Pests Act, keeps them going from early morning until late at night; but this is only what we anticipate, as harvesting time is always a busy season, be the crops what they may.

Cultivation.

Wherever the weeds have been allowed to go unchecked since the late rains, they should be turned under some time this month; and if crops for green manures—such as grey field peas, tares, rape, or rye—are to be sown among the trees, they should be put in as early as possible. If, however, no crop is to be sown, it would be well to allow the land to remain in the rough state after ploughing. It will gradually mellow down and remain in good condition until it is time to plough it again next spring.

Grading and Packing Fruit.

If growers would be more careful about this important work, they would (in my opinion) usually have less cause for complaint as to the prices obtained for the fruit by their agents. In the first place it is essential to see that the trees are well looked after, so that the fruit produced will be at least average specimens of their kind. Some growers, though, are not satisfied to grow only average specimens, but produce fruit above the average, by doing the work thoroughly; after which the grading and packing are easy of accomplishment. Their brands soon become known, and in consequence they seldom have cause to complain of the prices they obtain for their fruit. Fruit-growers in this State find in Sydney and some of the larger towns, a market second to none in Australia.

The chief points in grading apples are :—Size, colour, freedom from disease, and uniformity through every case.

The export market generally demands a good, clean, medium-sized fruit, 2½ inches being about the ideal, as the buyer generally wants what to the trade is known as a good count. Extra large fruit is not desirable, as these are generally coarse, and do not keep so well. As a general rule, three sizes are shipped (2½, 2¾, and 3 inches); with varieties such as Jonathan, that

have good colour and do not run large, $2\frac{1}{4}$ will pay to ship. When grading, any fruit which shows the slightest sign of disease should certainly be thrown out.

It is impossible to over-estimate the importance of grading apples for market. It is a thing which cannot be overdone. Most fruit is practically unsaleable without grading, and the better the grading the better it sells.

At our Bathurst Government orchard, when packing apples the following grades are adopted :—

Extra Choice—3 inches.

Extra fine specimens only, uniform in size, colour, and form, and without blemish.

Choice 1st—$2\frac{3}{4}$ inches.

Good fruit, not so fine as Extra Choice, uniform in size, colour, and form, and practically free from insect, injury, or defect.

Specially selected 2nd—$2\frac{1}{2}$ inches.

Mostly good eatable fruit, uniform, and not conspicuously marked by insect, fungus, or other damage.

Selected 3rd—$2\frac{1}{4}$ inches.

Third grade, uniform, sound, and free from conspicuous injury.

Every grower's pack should be as good as his bond; no topping up, nor filling up corners with small apples; buyers want honestly packed goods, and they are usually willing to pay good prices for such. Each case should be filled with the same grade throughout; a few seconds or culls scattered in with a lot of prime fruit give the buyer an opportunity to discriminate against the whole package, and ruin the reputation of the grower.

Apples must be cool and dry before being packed. Heat and moisture promote decay. Each case should be well filled, with the contents placed firmly and snugly. Every day consignments are placed on the market showing evidence of careless packing. If growers would consider for one moment the average route travelled by a case of apples for market they might be a little more particular. The case is taken from the packing shed and put on the cart; it is then hauled, perhaps, for some miles over the average country road to the railway station. After bumping along in the train for some miles, it is again unloaded and placed in a lorry and hauled for several squares over the city streets to the boat, where it is unloaded again ready for shipment to its destination, when, after some more knocking about, it is opened for the inspection of the foreign buyer, and to compete against the fruit of the world. Unless the case has been well filled and packed before starting, it will reach the market in what is commonly known as "slack" condition. The numerous jarrings received *en route* will have caused the contents to settle and shrink, with the result that the case will only be partially full.

Buyers will not pay the price of full packages for those received only filled in part. Not only is the sale affected in this way, but loose packing invariably causes bruises and the general defacement of each specimen. Too tight packing must also be guarded against, as this generally results in bruising. There is a happy medium in packing that can only be learned by practical experience.

Wrapping.

Whether the apples should be wrapped or not depends somewhat on the variety and the grade of fruit. Wrapping has several advantages:—

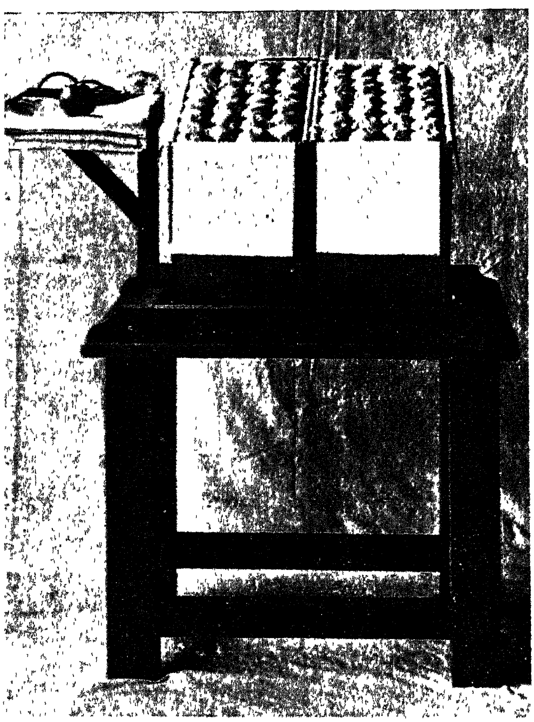
1. It serves as a cushion in the case of delicate fruit.
2. It prevents rot and fungoid diseases from spreading from one fruit to another.
3. It maintains a more even temperature in the fruit.
4. The fruit has a somewhat more finished appearance when exposed for sale.
5. Wrappers keep the fruit firm and snug in the packages.

Disadvantages of wrapping:—

1. It adds to the cost of packing.
2. It prevents rapid cooling in cases where the fruit is not cool at the time of packing.

Proper wrappers can be purchased by the thousand for the various-sized fruits, and a $2\frac{1}{2}$-inch fruit should not be wrapped in a paper large enough to accommodate a 3-inch fruit, nor should a 3-inch fruit have a wrapper put on it which has been cut to fit a $2\frac{1}{2}$-inch specimen.

When packing for export, proper tables are necessary (see illustration) for holding the cases during the process of packing.



Apple Packing Stand, as used at Bathurst.

The table is constructed of pine, like a kitchen table, so that it will stand perfectly firm and bear a fair weight. Strong ledges or battens are affixed firmly to front and back of the top of the table so that the fruit case may be tilted on the back one and prevented from slipping by the front ledge, as shown. At the left-hand side of the table a stand is affixed, with a ledged tray to carry the wrapping-paper, stencils, &c.

In making the table, the height should be such as to enable the packer to get his hands comfortably into the bottom of the case.

Strawberries.

The land should be in a good state of tilth, having been thoroughly worked to receive the young plants. If the intending planter has not raised the plants himself he should procure them from a successful grower, and see that the parent plants are strong, fruitful, and free from diseases. Distance of setting depends upon

the character of the soil, freedom with which the variety selected sends out runners, &c. In good soils the rows should be from 3 to 4 feet apart, and the plants 18 inches apart in the row. Compactly growing varieties may be planted a little closer. This is called "hill" culture, and consists of growing each plant by itself in a hill, not allowing the runners to grow; consequently each plant becomes stalwart and large, and when properly attended to produces the very finest fruits.

Matted rows.—This system is generally adopted by large growers, as it requires less labour to attend to a large area. By the matted row system more berries are produced on an acre than by the hill culture, but the latter method gives larger and finer berries. The rows are set from 3 to 4 feet apart, and the plants about 15 inches apart in the row. When the runners start they may be so arranged that they form a continuous matted row. The grower can suit himself as to how wide he allows the row to run. Some allow the rows to become 2 feet wide, and others only 1, according to the distance apart the rows have been set. The runners can be kept in check after the row has attained the desired width by using a roller cutter, running up and down between the rows, or by the use of the spade or hoe.

Before planting the new plant, all dead leaves and runners should be removed, and the roots shortened by at least one-third of their length.

The following are the number of plants to the acre, at the distances mentioned:—

2 ft. x 1 ft. ...	= 21,780	3 ft. x 1 ft. 6 in.	= 9,680
2 ft. x 1 ft. 6 in.	= 14,520	4 ft. x 1 ft. ...	= 10,890
2 ft. x 2 ft. ...	= 10,890	4 ft. x 1 ft. 6 in.	= 7,260
3 ft. x 1 ft. ...	= 14,520		

The following list comprises those varieties which at the present time are mostly grown for the best paying results:—Aurie, Annetta, Royal Sovereign, Captain, Trollope's Victoria, Edith, Marguerite, Sir Joseph Paxton, King Edward VII, Dr. Moree, Noble, Sunbeam, Melba.

Fruit Fly and Codlin Moth.

It seems almost incredible that any fruit-grower who is alive to his own interests would allow fly or moth-infested fruit to lie on the ground until the grubs have left them, but such is the case, and it is to these careless growers that we are usually indebted for the breeding and spreading of many of our pests. It is also these growers who give so much extra trouble to our Inspectors under the Fruit Pests Act, in seeing that no neglect takes place. It may be well for such careless growers to remember that they are a menace to their neighbours, and that by neglecting to pick up and destroy all fallen and infested fruit, they are liable to a fine. Any fruit-grower would be quite justified in notifying the Department whenever he is sure that his neighbours are trying to shirk their responsibility in this matter.

The following is a progress report, dated 31st January, 1911, by the Orchardist, of spraying experiments at Bathurst Experiment Farm:—

Codlin Moth.

I left one tree unsprayed with arsenate of lead in Block A.

1st examination of bandages	...	...	23 grubs.
2nd " "	9 days later	...	41 "
3rd " "	9 "	...	28 "
4th " "	9 "	...	24 "
5th " "	9 "	...	32 "
6th " "	9 "	...	43 "
Total	...	...	191 "

sprayed one tree only once. This was sprayed when the fruit had fairly set.

1st examination of bandages	...	...	28 grubs.
2nd " "	9 days later	...	54 "
3rd " "	9 "	...	48 "
4th " "	9 "	...	23 "
5th " "	9 "	...	16 "
6th " "	9 "	...	10 "
Total	...	...	179 "

The remainder of the orchard, a total of 2,000 trees, has been sprayed four times with the various brands of arsenates. From these trees we have killed 1,033 grubs, an average of ·516, or a little over half a grub to a tree.

Budding.

It is rather late, but if the month should prove a warm one, it is quite possible that buds would still take if inserted in deciduous trees which are not producing either good fruits or satisfactory crops.

Nursery stock may still be budded.

Preparing Land for Planting this coming Winter.

The land has never been in better condition for clearing, grubbing, ploughing, and subsoiling, preparatory to planting, than it is now, and those who intend planting this coming winter, and who have not completed these operations, should lose no time in finishing this work, so that new land will have a little time to sweeten before the young trees are set, as well as to enable the orchardist to complete all planting operations early in the winter.

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ..	Pansy 4th (imp.).	Coff's Harbour ...	20 June, '11.
,, ...	March Pansy ...	Earl March ..	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
Guernsey ...	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Trevallyn... ...	7 Sept., '11.
,, ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Lismore	10 April, '11.
,, ...	Star Prince ...	Calm Prince ..	Vivid (imp.)...	Dunoon	3 April, '11.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Casino	21 June, '11.
,, ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Berry Farm ...	*
,, ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 July, '12.
Ayrshire ...	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince ..	Rosie 5th ...	Grafton Farm ...	*
,, ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ...	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th .	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd March, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

AYRSHIRE.—Sandy: sire, Auchenbrain Spicy Jock (imp); dam, Rose Flower; calved 8th April, 1909; colour, brown and white. Price, £20.

Rose Flower is from Roseberry, by Daniel of Auchenbrain (imp.). Roseberry from Roseleaf of Barcheskie (imp.), by Mischiefmaker (imp.).

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRES.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, £15.

Emerald's Mischief: sire, Prince Emerald (imp.): dam, Miss Prim, by Mischiefmaker of Barcheskie (imp.), from Primrose of Barcheskie (imp.), by Royal Stuart of Glenbuck, from Lindsay 7th of Barcheskie; calved 4th August, 1903; colour, white and red. Price, £25.

WOLLONGBAR EXPERIMENT FARM.

AYRSHIRE.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved, 27th June, 1910; colour, white and brown. Price, £15.

HOLSTEIN.—Kuperus: No. 235. Sire, Obbe II; dam, Folkye (imp.); calved, 28th April, 1910. Price, £15.

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved, 13th February, 1901. Price, £15.

HOLSTEIN HEIFERS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Dam.	Sire.	Date of Birth.	Price.
				£
Lady Holland ...	Lady Hague ...	Obbe II	13 May, 1909 ...	20
Grace	Lady Grace... ...	do	5 May, 1909 ...	20
Gold	Marigold	President Douwe ...	30 September, 1909...	15

PURE-BRED RED POLL COWS FOR SALE.

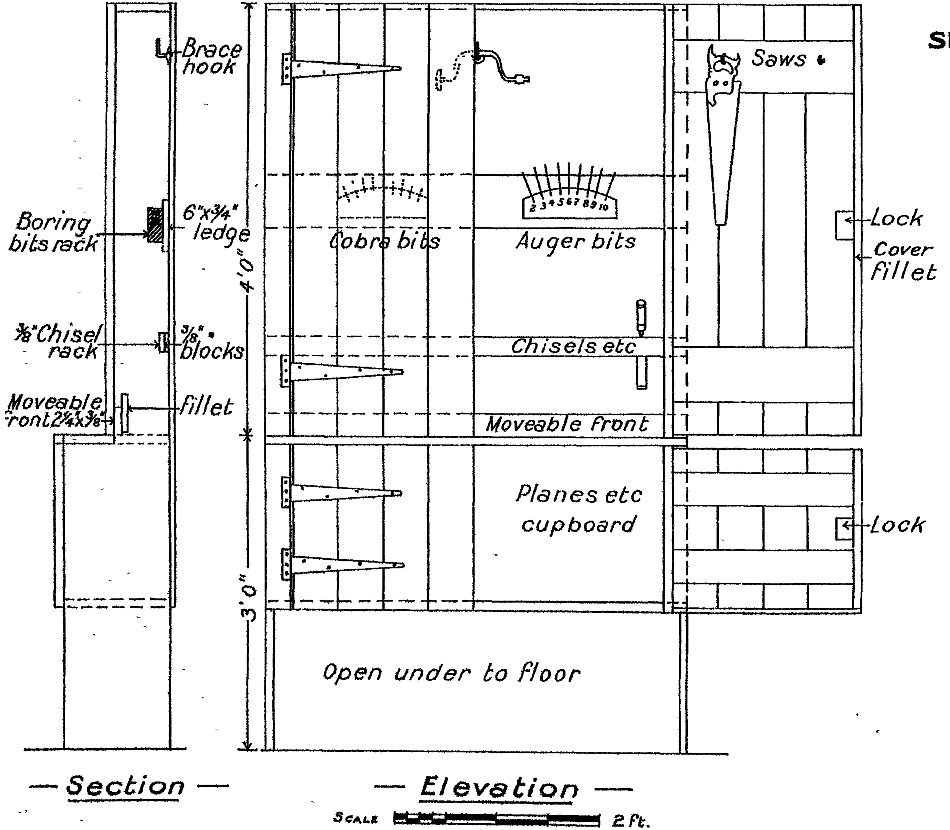
GRAFTON EXPERIMENT FARM.

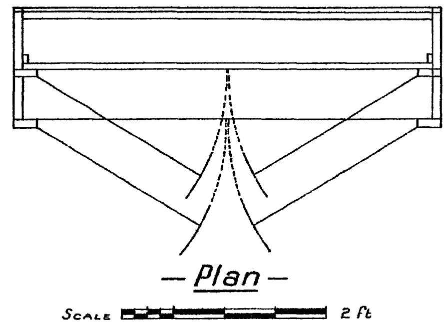
Milkmaid ...	Dairymaid II ...	His Worship ...	6 July, 1905 ...	25
My Love	Her Loveliness ...	The Judge	19 March, 1904 ...	25

H. C. L. ANDERSON,
Under Secretary.

SKETCH PLAN OF CARPENTER'S TOOL CUPBOARD,

TO BE MADE OF PINE.





Sides out of 12" x 1" cut down to 6" x 1" for upper part; lower part for large tools, such as planes, &c. Back and doors out of 6" x ½" T. and G. and B. or V. jointed lining on ¾" ledges. Doors hinged with 14" T hinges to 3" x 1" styles fixed over sides. Sides continued down to floor. Blocks for holding bits to be of 1¼" stuff, mortised out radiating as shown, to fit shanks of each bit. Bottom tray front sliding loosely between front styles and fillet, and chisel rack, front 2" x ⅜", fixed over four ⅜" thick blocks to give space behind. 2 large cap hooks on top ledge of each half of upper door for saws, and 1 on back for brace hanging. 3" brass cupboard lock and key to each pair of doors, keys to pass. Left-hand doors to be provided with inside hooks as holdfasts

A BROOKS
8 7.10

Agricultural Bureau of New South Wales

Branch.	Honorary Secretary.
Alumny and Carr's Creek ...	Mr. A. R. Wetherspoon, Alumny Creek, Grafton.
Bathurst	Mr. S. McKibbin, O'Connell.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown...	Mr. S. A. Levick, Roseneath, Cundletown.
Inverell	Mr. W. A. Koak, Rock Mount, Inverell.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. J. Halloran, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.

The readers of the *Agricultural Gazette* are invited to join their local branch. The Department will be glad to hear from persons who would be willing to form branches in other districts.

Bathurst.

Mr. Sanderson, M.R.C.V.S., Assistant Veterinary Surgeon of the Stock Branch, gave a demonstration and delivered a lecture on the 22nd February, on "Horses."

On 17th and 24th February Mr. Mathews, Sheep and Wool Expert, continued his demonstrations and lectures in sheep and wool, to the members of the Bureau, at the Experiment Farm.

Casino.

Mr. M. Henry, M.R.C.V.S., Veterinary Surgeon of the Stock Branch, lectured on "Cattle" to the members, on the 13th February.

Cundletown.

On the 9th February Mr. Dairy Instructor Hampshire gave a lecture on "Dairying."

Inverell.

Messrs. A. Lander and A. Manton, of Inverell, and C. J. C. Lewin, of Delungra, have been elected members.

Mr. M. Henry, M.R.C.V.S., Veterinary Surgeon of the Stock Branch, will lecture on "Cattle" on the 15th March.

Little Plain.

At the last meeting of the branch a paper was read by Mr. S. Leech, on "Wheat-growing in conjunction with Mutton and Wool." He pointed out the advantages gained by small wheat-growers rotating their crops and growing fodder for sheep. Besides the profit from wool and lamb, the grower "spells" his wheat land, and can help to keep it clear of wild oats and other strangers by grazing. Mr. Leech prefers Comeback, Steinwedel, and Marshall's No. 3 amongst the wheats, and Dwarf Essex Rape as fodder crop.

Mr. H. Taafe also contributed an article on "Grape-growing in the Inverell District." He considers there is a good opening for the cultivation of table grapes on the hills, where the soil is generally light and deep, but the heavy flats are unsuitable, being difficult to work and subject to frosts and floods. Vine-growing for wine-making needs capital and experience.

Parkes.

A branch has been formed at Parkes, with Mr. F. J. Glasson as Chairman, and Mr. J. E. Russell, Honorary Treasurer and Secretary. Annual subscription will be 2s. 6d. At the meeting held on the 4th February Mr. R. Job contributed a paper, "My experience with Manures," which led to a very interesting discussion.

In 1909, Mr. Job got 22 bushels of Bobs wheat per acre from 4 acres manured with 38 lb. superphosphate per acre, whilst unmanured land adjoining gave 18 bushels. With Turvey's Purple Straw, the results were 29 and 20 bushels. In 1910, 85 acres of fallowed land sown with Federation wheat, and given 45 lb. superphosphate per acre, yielded 22 bushels. Another 18 acres was not fallowed and unmanured; half of it gave 30 cwt. of hay and the other half 16 bushels of grain per acre.

Peak Hill.

Twenty-five members have joined this branch. Mr. J. J. McIntyre, of Peak Downs, Peak Hill, is the Chairman; Mr. J. Aubrey, of Hopefield, Mingelo, Vice-Chairman; Mr. W. Lampe, Brochtung, Peak Hill, Honorary Treasurer; and Mr. A. B. Pettigrew, of Peak Hill, Honorary Secretary. The annual subscription has been fixed at 2s. 6d.

On the 3rd February the Sheep and Wool Expert, Mr. Mathews, delivered a lecture to an interested gathering of members.

St. Mary's.

The Assistant Fruit Expert, Mr. J. G. R. Bryant, delivered a lecture on the 18th February on "Fruit Culture."

Wagga.

On the 14th February the members attended at the Wagga Experiment Farm, and, by permission of the Manager, were present at the veterinary instruction to the students. Mr. Palgrave, M.R.C.V.S., lectured, taking for his subject, "Complaints in Horses."

Walla Walla.

At the January meeting of the branch, Mr. D. H. McIntyre read a paper on "Breeding of Draught Horses." The author urged horse-owners to avoid breeding from horses with such hereditary defects as ringbone, sidebone, &c., and to endeavour to breed out minor faults by ensuring that they do not occur in both sire and dam.

On 21st February Mr. Palgrave, M.R.C.V.S., was to have given a demonstration and lecture on a veterinary subject.

Walli.

Mr. Inspector Reynolds lectured to the members on the 25th January on "Wheat-growing and the Cultivation of the Soil," and on the 10th February Mr. G. L. Sutton, Wheat Experimentalist, lectured on "Smut and its Prevention." It is whispered that the dance which followed was a great success, and that the ladies of the district are becoming ardent supporters of the Bureau.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agri culture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Braidwood P., A., and H. Association	L. Chapman	Mar. 1, 2
Bega A., P., and H. Society	T. W. A. Zingel	,, 1, 2, 3
Robertson A and H. Society	R. J. Ferguson	,, 2, 3
Bowraville A. Association	C. Moseley	,, 2, 3
Gundagai P. and A. Society	A Elworthy	,, 7, 8
Bangalow A. and I. Society	W [illegible] Reading	,, 7, 8, 9
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 7–11
Bombala Exhibition Society	W G. Tweedie	,, 8, 9
Gloucester A., H., and P. Association	S. J. Bignell	,, 8, 9
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 8, 9
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 8, 9, 10
Crookwell A., P., and H. Society (Annual Show)	M. P. Levy	,, 9, 10
Nepean District A., H., and I. Society (Penrith)	P. C. Smith	,, 9, 10
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 9, 10
Central New England P. and A. Association (Glen Innes)	G. A. Priest	,, 14, 15, 16
Cumnock P., A., and H. Association	A. M. Martin	,, 15
Campbelltown A. Association	F. Sheather	,, 15, 16
Cobargo A., P., and H. Society	T. Kennelly	,, 15, 16
Tumut A. and P. Association	T. E Wilkinson	,, 15, 16
Bellinger River A. Association (Bellingen)	S. S. Hindmarsh	,, 15, 16, 17
Mudgee A. Society	H. Lamerton	,, 15, 16 17

Society.	Secretary.	Date.
Quirindi District P., A., and H. Association	G. Haughton	Mar. 15, 16, 17
Port Macquarie and Hastings District A. and H. Society	W. R. Stacy	,, 16, 17
Goulburn A., P., and H. Society	J. J. Roberts	,, 16, 17, 18
Armidale and New England P., A., and H. Association	A. McArthur	,, 21–24
Molong Agricultural Society	W. J. Windred	,, 22
Camden A., H., and I. Society	C. A. Thompson	,, 22, 23, 24
Clarence P. and A. Society (Grafton)	T. T. Bawden	,, 22, 23, 24
Taralga A., P., and H. Association	G. C. Goodhew	,, 23, 24
Wauchope P., A., and H. Association	A. D. Suters	,, 23, 24
Newcastle A., H., and I. Association (Annual Show)	C. W. Donnelly	,, 23, 24, 25
Blayney A. and P. Association	E. J. Dann	,, 28, 29
Merriwa A. and P. Association	V. Budden	,, 28, 29
Lower Clarence A. Society (Maclean)	F. W. Collison	,, 28, 29
Walcha P. and A. Association	J. New-Campbell	,, 28, 29
Narrabri P., A., and H. Association	H. R. Thurlow	,, 28, 29, 30
Adaminaby P and A. Association	Wm. Delany	,, 29, 30
Coonabarabran P. and A. Association	G. B. McEwen	,, 29, 30
Liverpool A., H., and I. Society	W. E Learoyd	,, 29, 30
Yass P. and A. Association	W. Thomson	,, 29, 30
Luddenham A. and H. Society	F. Shawe	April 4, 5
Cooma P. and A. Association	C. J. Walmsley	,, 5, 6
Dorrigo A. Society	F. T. Stennett	,, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 5, 6, 7
Royal A. Society of N.S.W. (Sydney)	H. M. Somer	,, 11–19
Corowa P., A., and H. Society (Horticultural Show)	J. D. Fraser	,, 12
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 12, 13
Batlow A. Society	G. F. Briggs	,, 19, 20
Bathurst A., H., and P. Association	A. H. Newsham	,, 26, 27, 28
Hunter River A. and H. Association (West Maitland)	E H. Fountain	,, 26–29
Richmond River A., P., and H. Society (Casino)	D. S. Rayner	May 3, 4
Orange A. and P. Association	W. Tanner	,, 3, 4, 5
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 4, 5, 6
Dubbo P., A., and H. Association	F. Weston	,, 10, 11
Dungog A. and H. Association	C. E. Grant	,, 10, 11
Coonamble P. and A. Association	J. M. Rees	,, 17, 18
Walgett P. and A. Association	S. E. Johnston	,, 17, 18
Central Australian P. and A. Association (Bourke)	G. W. Tull	,, 24, 25
Hay P. and A. Association	G. S. Camden	July 11, 12
Deniliquin P. and A. Society	L. Harrison	,, 20, 21
Narrandera P. and A. Association	W. T. Lynch	Aug. 2, 3
Hillston P. and A. Association	S. I. Gordon	,, 3
National A. and I. Association, Brisbane, Queensland	C. A. Arvier	,, 7–12
Bogan Gate P. and A. Association	B. M. Lowing	,, 9
Corowa P., A., and H. Society (Annual Show)	J. D. Fraser	,, 15, 16
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 22, 23, 24
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 22, 23, 24
Parkes P., A., and H. Association	G. W. Seaborn	,, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton	,, 29, 30, 31
Young P. and A. Association	G. S. Whiteman	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys	,, 6, 7
Cootamundra A., P., H., and I. Association	T. Williams	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith	,, 13
Canowindra P., A., and H. Association	G. Newmon	,, 19, 20
Temora P., A., H., and I. Association	J. Clark	,, 19, 20, 21
Ganmain A. and P. Association	J. H. Ashwood	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther	Oct. 4
Tweed River A. Society (Murwillumbah)	A. E. Budd	Nov. 8, 9

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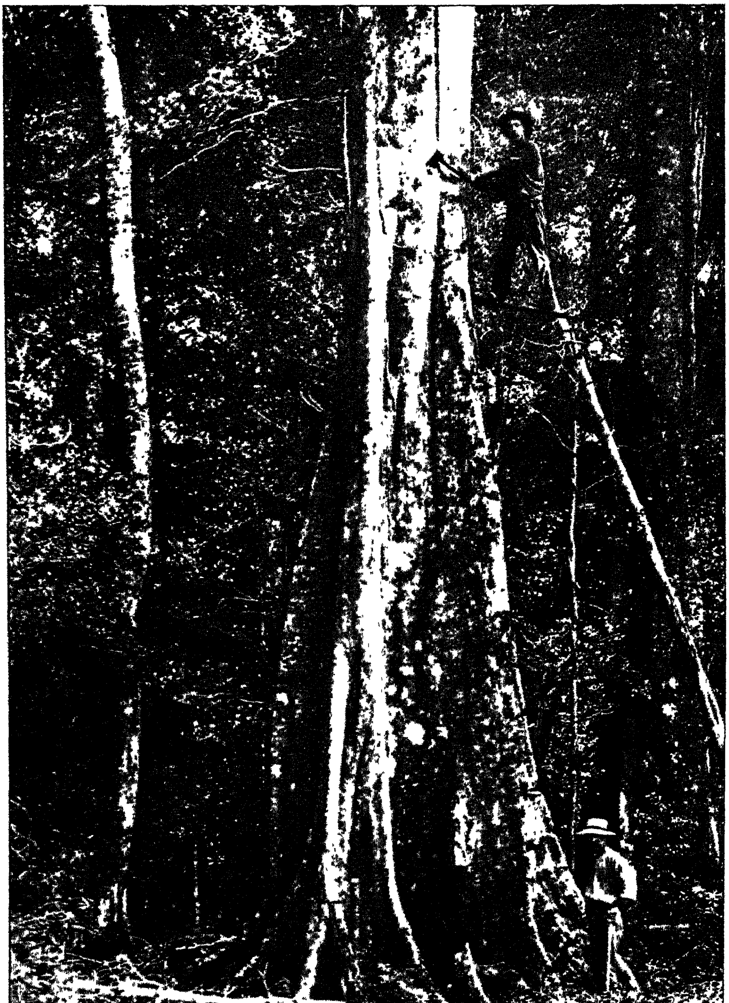


**Using the spring-board to fell a Carrabean tree on the Dorrigo.
The spring-board is 20 feet from the ground.**

VOL. XXII. PART 4 APRIL 3, 1911.

Agricultural Gazette of New South Wales.

The Dorrigo.

GEORGE MARKS, Inspector of Agriculture.

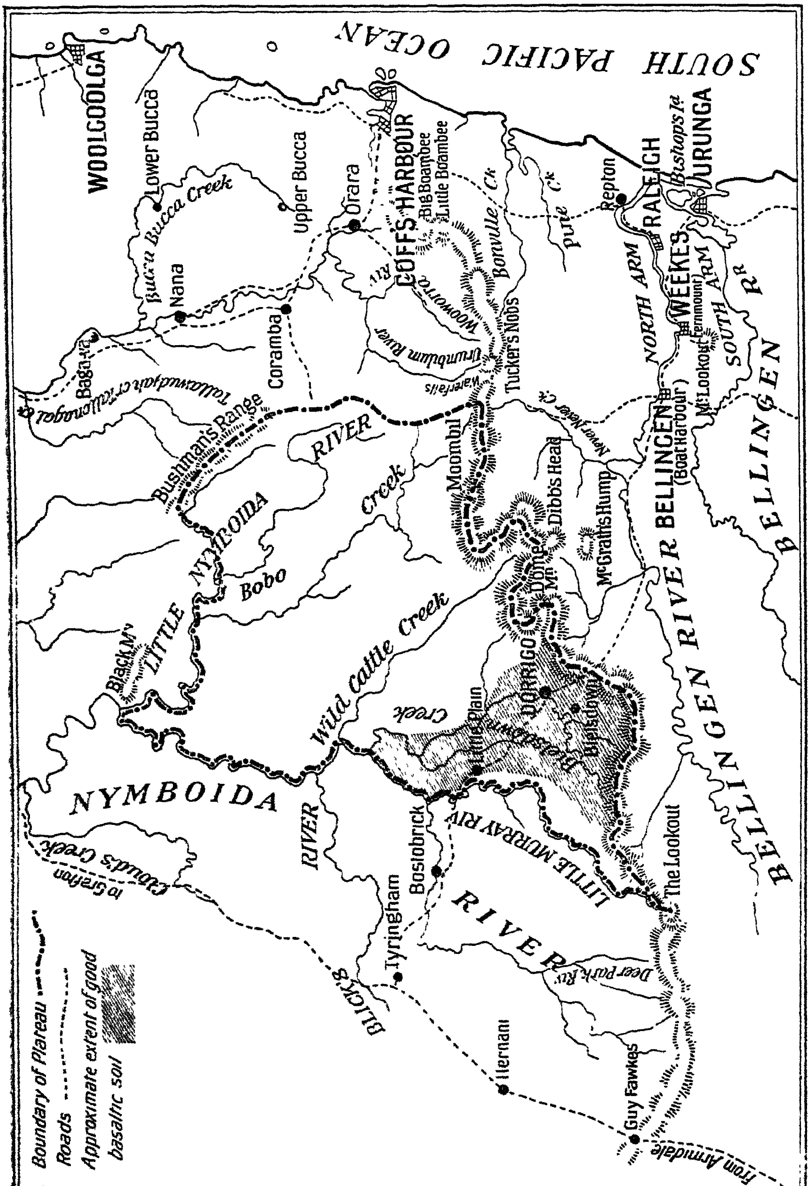
ALTHOUGH the history of Dorrigo extends over half a century, it is only within the last few years that this district has really come into prominence; and now that its capabilities are becoming more generally known, numerous inquiries are continually being made by people in search of land. Formerly Dorrigo was looked upon as the cedar-getter's paradise; but since the establishment of the dairying industry, the construction of roads, and consequent marketing of commercial timbers, the district is progressing by leaps and bounds, and is destined to develop into one of the most prosperous centres of the North Coast.

Access to the Dorrigo.

At present, practically the only road fit for heavy traffic is from Bellingen. Seen from this town, the Dorrigo mountain stands out like a great wall running north and south. After leaving Bellingen the road winds along the river bank until it reaches the foothills of the range at Never-Never, 10 miles distant. Here the main arm of the Bellinger River is crossed, and along a well-graded road begins a continuous climb of over 7 miles before the top of the mountain is reached. The road winds around the numerous spurs in a tortuous fashion, and everywhere magnificent views are obtained of the Bellinger Valley below. In many places the road is cut into the solid rock of the mountain side, while its outer edge is built up of stonework, and the curves are so sharp that the utmost care is required of teamsters in negotiating them. In one of the gorges, hundreds of feet deep, may now be seen the whitened bones of what originally constituted one of the finest horse teams that travelled the district.

Thousands of pounds have been spent on this road, and many of the dangerous portions have been fenced, but constant attention is required on account of the heavy rainfall and steep grades. In spite of all, traffic is occasionally blocked by one of the giants of the scrub falling and breaking away the embankments.

About half-way up the mountain two waterfalls are met with, and in the rainy season the water is frequently forced across the road into the gorge below. The scenery is magnificent. The numerous species of trees which comprise this dense scrub embrace every shade of green, and vie with each other in their endeavour to reach the sunlight above. Below, the scene is enlivened by the bright greens of the many varieties of ferns, palms, shrubs and flowers, while most of the trees are festooned with creepers, and form hosts for the many species of staghorns, bird's-nest, and harefoot ferns.



Sketch Map showing Dorrigo Plateau and approaches.

Numerous flame trees, with their brilliant scarlet flowers, lend a lovely touch of colour to the sea of green. As the Dorrigo is being rapidly denuded of its original timbers, provision has been made for suitable areas to be reserved for the preservation of native flora.

Twenty miles from Bellingen is situated the town of Dorrigo, on the banks of Bielsdown Creek. It may be looked upon as the centre of the Dorrigo district. It is 44 miles from Coff's Harbour, 16 from Tyringham, and 39 from Guy Fawkes. There is a weekly steamer service to the Bellinger River, but owing to the uncertain state of the bar, steamers are not able to cross in or out with any degree of regularity, so that the bulk of the passenger traffic comes *via* Coff's Harbour. Here there is a regular bi-weekly service to the metropolis. Coaches run to meet the boats, and convey passengers through to Dorrigo and district when required. Those who prefer to travel overland can do so by coming *via* Armidale and Hernani, there being a through mail service twice a week.

The importance of the district is being recognised, and well-graded roads from Dorrigo to Coramba, and Dorrigo to Hernani, are nearing completion. The former deviation will shorten the route considerably for people from Coramba, the distance being 38 miles as against 55 *via* Coff's Harbour and Bellingen. The second road goes through Deer Vale, and after providing means of access to the many new selections along this route, connects with the main Grafton-Armidale road, at Hernani, 28 miles distant. In addition to these, roads are in course of construction throughout the whole district to enable settlers to reach their holdings. With the exception of the road to Bellingen, the majority of the roads are not metalled. They form very good roads in dry weather, but in the wet season they are simply wretched. The rain softens the red porous soil till the roads are almost impassable, and the mud sticks to everything like glue. In several places dairying is being carried on where no wheeled vehicles can be used, and the cream is conveyed to the factory on packhorses.

The Plateau.

The Dorrigo plateau, which embraces Dorrigo, Eastern and North Dorrigo, Wild Cattle Creek, and Deer Park (now known as Deer Vale), is situated in County Fitzroy, at the head of the Bellinger River. It has an elevation of from 2,000 to 3,000 feet. The climate is most exhilarating, the summers are delightfully pleasant, the winters cold, and in some of the more elevated parts snow occasionally falls. The annual rainfall is about 60 inches. The wet season generally commences about Christmas, and continues till April or May. The country is undulating to hilly in nature, and splendidly watered. Every valley has its spring or creek, and the waters from these form beautiful cascades and waterfalls, as they flow down the mountain sides into the tributaries of the Nymboida River below. The soil is red and chocolate in colour in the Dorrigo and North Dorrigo districts, very porous, and of volcanic origin. Basalt is plentiful in all the creeks, while outcrops of it are to be found here and there throughout the district.

The Soil.

The richest soil is usually located on the tops of the ridges, that along the creek banks being much inferior. In the Eastern Dorrigo district the soil is of a much lighter colour and inferior in quality. The soils in their

virgin state are more or less acid, but with the clearing operations and consequent exposure to weather conditions, they sweeten and improve from year to year, so that the best cultivation paddocks and pastures are to-day found on the oldest farms in the district. The light yellow soil found in the Eastern Dorrigo is probably derived from bedded tuff. Throughout the whole plateau the soil is very irregular in quality. One farm may consist of rich soil, while its neighbour may contain second-class or inferior soil.

The tableland is admirably adapted for the growth of cool-climate grasses, suitable for grazing or dairying, also for the cultivation of cool-climate fruits and crops. A large proportion is unsuited for agriculture, on account of its hilly nature, but on most of the farms sufficient land may be obtained for the growth of crops suitable for feeding to dairy stock. As in the Richmond River scrub soils, the mould-boards of ploughs never "clean"; yet at the same time ploughing may be carried on almost immediately heavy rains cease.

In the vicinity of Dorrigo, on the Bielsdown Creek, and at North Dorrigo are found open flats that never grew timber in their virgin state, yet they have similar soils to the timbered areas that surround them, and are apparently identical in their chemical composition and mechanical nature.

Early Settlement.

There appears to be a great difference of opinion regarding the origin of the name Don Dorrigo, or, as it is now more generally called, Dorrigo. Some of the oldest settlers assert that it originally came from a Spaniard named Don Diago, who came to the district in the early days. Others regard this Spaniard as a mythical individual. They claim the name is that given to the place by the native blacks; that it was used by them as one word, the pronunciation being "Dundurrigo," spoken sharply as was their native custom It is only within the last twenty-five years that the name has been attached to the district; prior to that is was known as the Bostobrick Cedar Scrub.

The early settlement of Dorrigo gradually approached from the west. In those days the blacks were very numerous and treacherous, and it is recorded that several whites were murdered in the vicinity of Guy Fawkes. Amongst them was a settler, Surveyor Meldrum, living in the vicinity of the Bald Hills, who with his wife and three children were done to death by the savages. The memory of the unfortunate family is perpetuated in the name Meldrum Downs. The blacks had two borra grounds in the district—one at Borra Creek, the other near Bostobrick. These were cleared circular areas where the young men were trained to be huntsmen and warriors.

In 1857, Mr. M. Cloggen settled at Bostobrick. He brought cattle from the western district, and was the first man to send pit-sawyers into the Dorrigo scrub. Mr. Williamson arrived at Tyringham in 1857, to take part in the cedar industry. Giant cedars were plentiful everywhere, many having a clear barrel of 80 feet before reaching the first branch. After felling the trees the usual method was to erect rough scaffolds on the side of a hill on which the logs were placed, and an excavation was made beneath for the

men to work in. The cedar was then sawn into flitches, placed on a sledge made out of the fork of a tree, and drawn out by bullocks to depôts on level ground. Tracks were afterwards brushed to these depôts, and in fine weather the timber was drawn to market on waggons.

It was customary for the Government to mark off blocks of scrub 1 mile square, by blazing trees, estimate the amount of standing cedar, and submit these blocks to auction. The successful purchaser was required to cut and remove the timber within twelve months. At that time cedar was worth 34s per 100 superficial feet at the pit, and cost 25s. per 100 superficial feet to haul it to Armidale, which was at first the only market, a distance of over 80 miles. On the rough roads 1,200 superficial feet was considered a big load. In later years the trade was divided between Armidale and Grafton.

The first men to settle on Little Plain, North Dorrigo, were Messrs. Coglan, Williamson, and Mulligan. In 1861, Sir John Robertson's Land Act came into force, and the first to avail themselves of it were Messrs. W. Spokes and W. Sinclair, at Paddy's Plains. Messrs. J. Williamson and G. Edwards took up blocks 1 and 2 at Bielsdown Creek, Dorrigo, now held by Messrs. W. Johnston and J. Wills. Efforts were afterwards made to get a road to the coast, and, after considerable difficulty, a bridle track was brushed by Mr. John McGrath, assisted by natives. In later years between £7,000 and £8,000 was spent by the Government in constructing a road up the mountain, and thus a large quantity of cedar and other timbers was able to be sent to the Sydney market *via* the Bellinger River. Twenty-five years ago endeavours were made to replace some of the cedar, and a nursery was established at North Dorrigo, but the attempt resulted in complete failure.

The Coming of the Cow.

Up to this period the principal source of income was derived from the timber industry, and those engaged in it were naturally anxious to keep it to themselves. An endeavour was made by some dairymen from the north and south coasts, who knew the value of the land, to have the scrub surveyed into blocks for selection, and in 1894 the first subdivision was thrown open at £2 per acre. Several inspected the blocks, but were disappointed at the high price charged and their isolated positions, and returned home. About six months later the Lands Department reduced the price to 30s., and blocks were taken up by dairymen from the Richmond River and the South Coast, who immediately set to work to clear the scrub and make homes for themselves. The cedar-getters laughed at the idea of these men expecting to make a living from such land, and sarcastically told them that twelve months would see them all "humping bluey" in single file down the mountain on their way home again.

These farmers had much to contend with. The climatic conditions were very different to what they were accustomed to; many lessons had to be learned by experience; and when in later years they were able to cultivate a portion of their land and grow crops, the difficulty and cost of conveying their produce to market left them a very small margin of profit.

Dorrigo Butter Factory.

In 1906, the Dorrigo Co-operative Dairy Company was formed, and on 21st November of that year, the factory was opened with a roll of twenty-eight suppliers. Mr. E. G. Stoeckert was appointed manager. Prior to the opening of this factory, those engaged in dairying laboured under great difficulties. The cream had to be conveyed on packhorses, some in kerosene-tin buckets, along bush tracks to the foot of the mountain, where a van collected and carried it to the Fernmount Butter Factory, a total distance of 24 miles.

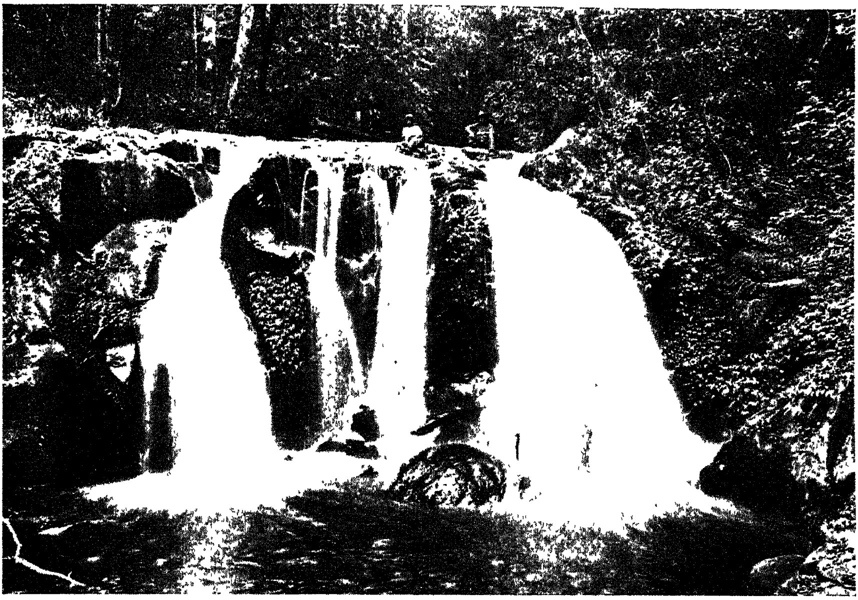
The number of suppliers and amount of cream are now steadily increasing. For the first year's operations, 56 tons of butter were made. In 1908 the number of suppliers increased to fifty-two, and the output of butter to 78 tons. In 1909 there were seventy-two suppliers, and 102 tons of butter made; and for 1910 the suppliers numbered eighty-six, the butter manufactured being 156 tons. For the week ending 17th December last, 5 tons were made. The original plant and buildings were found inadequate to cope with the increased supply, and substantial improvements have been effected and additional plant secured, which will enable a maximum quantity of 16 tons of butter per week to be made.

The company commenced operations with a capital of £1,500, but the authorised capital has since been increased to £10,000. At the commencement of the factory work, a 2-ton Hercules refrigerator was used. This has since proved to be too small, and a 10-ton steam-driven Linde refrigerator has been added to the plant. A never-failing supply of the best water is obtained from the Bielsdown Creek. A movement is now being made with the view of establishing a bacon factory.

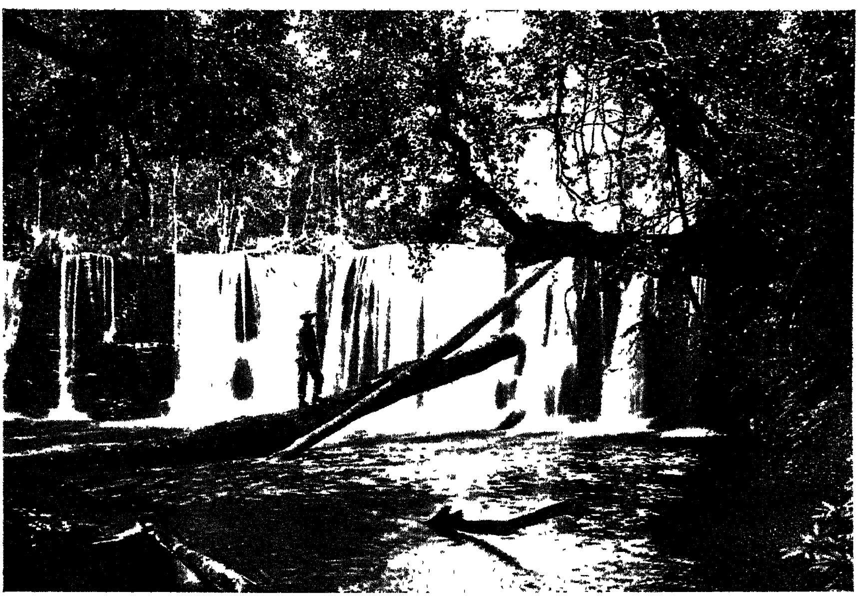
The company is under a big expense in getting butter to Sydney. It is conveyed to Bellingen in a covered van, the cost being 1s. per box (£2 per ton), and thence per steamer, which costs 1s. 3d. per box (£2 10s. per ton), or a total of £4 10s. per ton. Some splendid herds are to be seen in the district, and good cheques are being obtained. One of the most successful dairymen is Mr. J. W. Johnstone, who for the past twelve months obtained over £600 for cream alone.

Dorrigo Timbers.

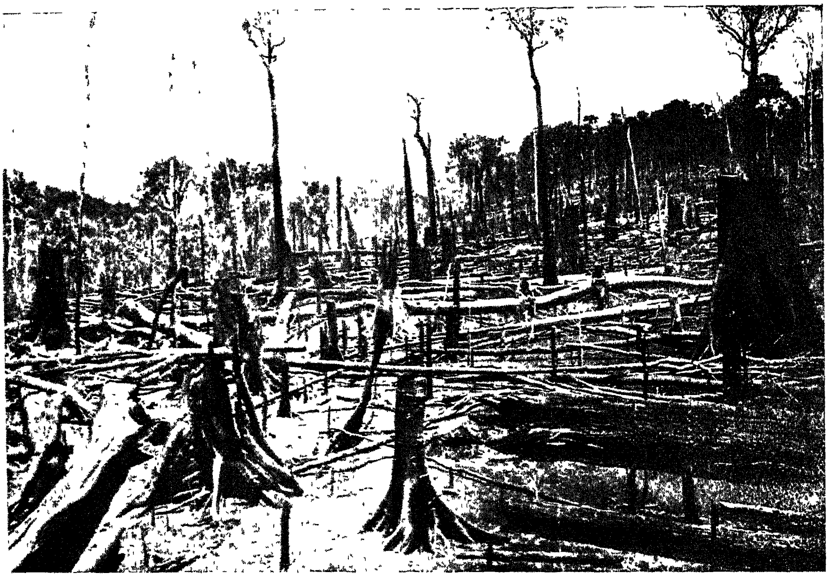
The Dorrigo plateau was originally covered with dense scrub, and whilst the march of civilization is causing the destruction of this jungle, there yet remain thousands of acres standing. During the past twelve months it is estimated that fully 3,000 acres of timber have been committed to the flames, so that at the present rate it will not be very long before the entire original scrub has disappeared. Unfortunately, the farmers are cutting out almost every inch of scrub as fast as they can to make room for grass. No provision has been made in the direction of leaving suitable belts for providing shade or shelter for stock, with the result that already many parts are fully exposed to every wind that blows. During the cold winter months this has a marked influence on both vegetation and stock.



One of many waterfalls on the Little Murray River, Dorrigo.



Waterfall at Rocky Creek, one mile from Dorrigo. Summer flow,



"A good burn." Portion of a block of 120 acres recently burned.

A paddock of cocksfoot, rye-grass, and white clover, twelve months after the scrub was fired, nine months from the time of planting seed. In places it is waist high. Many of the logs will have to be cut to enable stock to get about.

Over fifty different kinds of timber are to be found in the scrub. Amongst them may be mentioned red cedar, rosewood, yellow and red carrabean, pine, prickly ash, sassafras, crab apple, beech, coachwood, niggerhead, black apple, beefwood, fig, and leather jacket. The red cedar is getting very scarce, though in some of the more remote places good trees are yet standing. Along the banks of the Little Murray, and fringing the scrub in other localities, may be found the various classes of hardwood, such as ironbark, box, tallow-wood, gums, oaks, &c. There are saw-mills constantly at work at Rocky Creek, Dorrigo, North Dorrigo, and Wild Cattle Creek; but operations are greatly hampered by the bad state of the roads, and the cost of hauling the timber to Bellingen, which amounts to 3s. per 100 superficial feet for pine, and 5s. per 100 for rosewood. For the past six months one mill forwarded timber to the value of £5,000 to Sydney, the freight on which to Bellingen alone cost £1,050. In Eastern Dorrigo there are saw-mills at Ashton and Ulong Creek, the timber for which is conveyed to Coff's Harbour, *via* Coramba, for shipment. Timber is in great demand, and mills are being established in suitable localities as fast as serviceable roads are constructed. All have unlimited orders on hand. One mill was recently requested by a Sydney firm to supply 500 logs a month, but this was impossible. The principal timbers now being cut are pine and rosewood, with smaller quantities of prickly ash and beech. Horse-teams are principally used on the metal roads, while in the scrub the indispensable bullock-team is always in evidence. Teamsters make splendid wages, but their yearly income is considerably lessened by the months of wet weather, when the roads at times are impassable. A team of 36 bullocks is no unusual sight during the rainy season.

Destruction of Timber.

It is deplorable to see the vast quantities of valuable timbers destroyed every year. Many of them are at present little known, but are unsurpassed for many classes of indoor work, cabinet-making, coach-building, &c., and in several homes in Dorrigo many of these woods have been tastefully arranged, giving a most pleasing and artistic effect when varnished. The timber is of no value to the selector. If he wishes to market it, there are no roads or means of getting it away, and so the flames are fed. It will only be when these timbers are not procurable in any quantity that their real value will be realised. The construction of the railway recently authorised by Parliament will enable large additional quantities to be conveyed to market; but until that is completed destruction must continue. Unfortunately, trees of commercial value, if left standing during clearing operations, are rendered valueless, as the fire kills them, and they are speedily riddled with borers and white ants.

Experiments are being made with the view of testing the suitability of crab apple for making butter-boxes. Should this prove successful, a profitable business could be built up, as this timber is plentiful and the trees grow to a large size.

Prospects of Dorrigo Settlers.

In the Dorrigo district may be found settlers representing almost every walk in life. The profitable returns from dairy farms on the North Coast naturally created a keen demand for land, and at every subdivision the applicants far outnumbered the blocks that were available, so that they had to be balloted for. Young and old, rich and poor, experienced and inexperienced, all endeavoured to secure blocks. In addition, there were those whose sole ambition was to acquire land by any means, do no more than fulfil the conditions required by the Act, and wait for the first opportunity to transfer or sell at a highly remunerative figure to some innocent newcomer. The land speculator is much in evidence; weeds and other rubbish are allowed to take full possession, and the progress of many localities is being thus retarded.

The Dorrigo is no place for the individual without capital or experience. The dense growth of timber has to be got rid of, which is somewhat slow and laborious work. Sound judgment has to be exercised in felling and firing; grass seeds have to be bought and planted; weeds kept in check; logs heaped up and burnt; fences and buildings erected, and stock and implements purchased. It takes at least two years from the time the scrub is felled till grass is sufficiently established to carry stock, and costs fully £5 an acre to convert the land into fair pasture. With those having limited means, or lack of experience, it is a long uphill fight; and work that, for these reasons, cannot be carried out, or is performed at unsuitable periods, means extra labour, time, and expense.

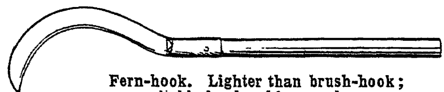
It must not be supposed, however, that persons without capital cannot succeed. On the contrary, there are many who, while waiting for the scrub to dry, or grass to grow, work on the many new roads that are being made, and save sufficient money to enable them to clear and improve their selections till a regular income is assured from the farm. But a certain amount of experience is essential, as has been proved by some would-be farmers attempting to burn off scrub in the middle of winter. Labourers are scarce, and wages high; consequently the man who takes up land must be prepared to engage in all classes of work himself

As in other localities, the quality of the land can be readily determined by the class and size of timber that grows on it. Yellow and red carrabean, red cedar, and rosewood, are always typical of good country, while niggerhead and coachwood denote inferior land. Furthermore, the heads of trees growing on rich soil are much larger, and the foliage more dense than on those of the same species found on inferior country, and to an experienced eye they can be easily detected at a distance. On the other hand, there are certain trees, notably the sassafras, that grow freely on all classes of soil. Niggerhead is a hardwood, and is the best of all the scrub timbers for fencing, &c.

Clearing.

Although the scrub is so heavily timbered, it is not so difficult to get rid of as the average outsider would imagine. The wood of most of the trees is soft and easily cut, and if the felling and firing are done at the right time of the year, it speedily decays, and will burn out in a few years. There is also an absence of suckering, so common in the hardwood country. Of course, where the hardwood timbers, such as gums, ironbark, tallow-wood, blackwood, &c., are growing, the labour of felling and burning is much more difficult, and there is nearly always trouble with the undergrowth sprouting again.

Brush-hook.



Fern-hook. Lighter than brush-hook; suitable for brushing weeds.

Felling is usually done from January to June. The undergrowth and young trees of 2 to 3 inches diameter are first cut down with a brush-hook. This is very important. The "running" of the fire is materially influenced by the thoroughness with which this work is performed. Then comes the felling of the trees. Those of small diameters are felled in the usual way, but most of the larger trees, particularly the carrabean, fig, and sassafras, have abnormally developed butts, usually with broad "wings," and this renders it necessary to use the "spring-board."

The Spring-board.

By the use of this contrivance the tree is cut some distance from the ground, usually from 8 to 12 feet, and occasionally as high as 20 feet. A great deal of labour is thereby saved, as in addition to the smaller diameter, the wood is straighter and freer in the grain, which renders the cutting much easier. It requires nerve and experience to "scaffold" a tree well, and to swing the axe with either right or left hand. This latter qualification enables both sides to be cut without shifting the spring-board. Trees may be felled singlehanded, or by two men, in which latter case the men swing their axes from opposite sides.

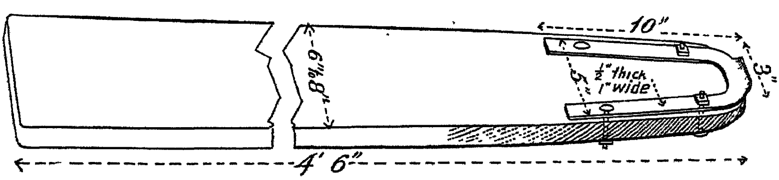
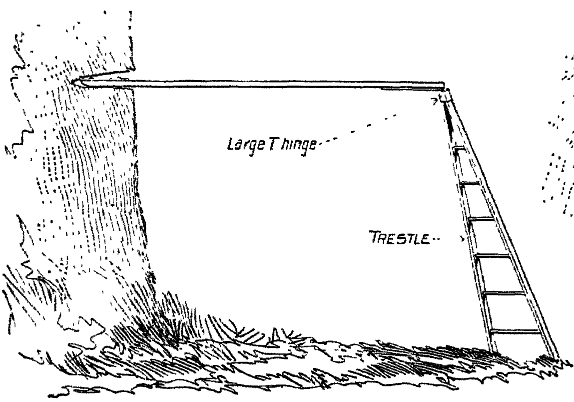


Diagram showing construction of spring-board.

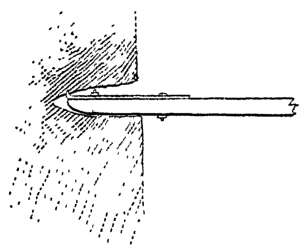
The spring-board is made of some light, tough wood, is about 4 feet 6 inches long, and 6 to 8 inches wide. At one end an iron shoe with a turned-up edge is securely bolted. This is necessary to "bite" into the recess cut in the side of the tree, and prevent slipping. At this end the board is about 2 inches thick, but it tapers to about 1¼ inches at the other end. Red cedar is prized

amongst expert axemen for the purpose. It is tough and light, and with the imprints of nails from the boots, affords sure foothold for the men whilst at work. Where hardwood timber has to be employed, the "board" may be reduced to 1 inch in thickness. Anything of the nature of a "short" or "cross" grain has to be carefully avoided in selecting the timber. A piece of sheet tin is usually tacked on the side underneath the iron shoe, to protect it from bruising.

It is essential that the spring-board be light. It has to be lifted and placed in position, or lowered, with one hand, the other being engaged in holding on to the tree; and should the tree crack unexpectedly and commence to fall, the descent has to be made very quickly.



Trestle platform. The trestle is used as a ladder. This form is used principally by people lacking in nerve and who are not expert on the spring-board. It will reach 6 to 8 feet from the ground.



Showing how the spring-board is secured to the tree. The leverage on the outer end causes the edge of the shoe to "bite," so that it cannot slip.

Another form of platform is sometimes used in the form of a trestle, but the one described is more serviceable and universally used by expert axemen, and it may be adapted to any tree and at any height.

Drive-trees.

When possible, a "drive" tree should be used. A number of trees are cut half-way through, or a little more, and left standing. Then the drive tree, which is usually a large one, is felled so as to strike its partially-cut neighbour and snap it off. This one in turn strikes others, and it favoured with a suitable wind, trees covering from one to several acres in extent may be brought down at once. Occasionally trees "miss," and have to be gone over again.

Scrub-felling is dangerous work, and should never be undertaken by a lone man. A quick eye and keen ear are indispensable, and even with the best judgment, a tree may snap unexpectedly, or rebound off another. It is scarcely necessary to mention that the tools should have keen edges, and be

kept in good order by occasional use of the grindstone, and more frequent application of the small carborundum stone, which is carried in the pocket.

The cost of felling ranges from 30s. to 40s. per acre, according to the density of the scrub.

Burning.

It is advisable to fell a fairly large area to get a good burn; but, at the same time, it must be borne in mind that seed has to be planted and weeds and rubbish kept in check, otherwise a great deal of extra labour and expense is involved.

The best month to fire is generally December. Good burns are frequently obtained in October, in scrub felled early in the year; but, as a rule, the weather is only beginning to get warm during this month. If left till after December, there is usually difficulty in avoiding the heavy rains which set in and continue at frequent intervals till winter.

The scrub must be fired when it is sufficiently dry, and on a hot dry day. Experience has proved that such a day, accompanied with a westerly wind, gives the best burn; but it may not always be practicable to take advantage of such a wind on account of the proximity of a neighbour's homestead or crop.

The scrub should be fired as quickly as possible to get a good "face," and to secure this the fires are started at short regular distances on the windward side, by several persons working pre-arranged sections. Kerosene torches facilitate this work. These consist of narrow strips of bagging wound round and nailed to a stick, and then saturated with kerosene. Two are usually carried by each person, one in reserve, to be used when the first burns out.

A scrub fire is a magnificent sight. The flames run and leap a hundred feet high, and burn everything except the logs and stumps. These speedily decay, and in a few years the bulk of them will easily burn away. Everything in the form of vermin is destroyed, the most objectionable being the tiger snake, which is fairly plentiful.

Sowing Grasses.

On the Dorrigo, all the English grasses and clovers grow to perfection. *Paspalum* also thrives for about seven months of the year. The selection of the seed for the mixture demands more than ordinary attention On practically every farm in this district sorrel has been introduced with the grass seed, besides many other types of weeds. The seed is sown after the fire, between the charred stumps and logs. The first rains that fall cover it. The best time to sow *Paspalum* is from October to December, and sowing may be continued till January; but unless it is got in fairly early, it does not get a chance to grow before the heavy frosts set in.

The cool-climate grasses, such as cocksfoot, rye, prairie, fescue, and white and red clover, should be planted in March or April. If planted in the middle of December or January, the seed would germinate with the first rains, and the hot sun would speedily kill off all the young plants.

Prime hand-shaken *Paspalum* should be purchased, and if chipped in will readily germinate; but this method could only be carried out on a small scale. Eight to 10 lb. are sown in a mixture, 10 to 15 lb. by itself. About a bushel of good clean mixed seed is ample for an acre if carefully and evenly distributed, and the cost may be set down at from 15s. to 20s. per acre. A good deal of actual monetary expense could be saved after the first season by saving and planting one's own seed.

The mixture favoured by some of the old residents is paspalum, cocksfoot, and white clover. No mistake could be made by increasing the number of grasses composing the mixture. The addition of prairie, lamb's tongue or rib-grass, Kentucky blue, the fescues, meadow foxtail, couch, and rye would improve the pasture, and provide a greater variety for the stock.

Weeds.

There is nothing that thrives so well on the Dorrigo as weeds. The inkweed or dye-berry grows to a height of from 5 to 10 feet. The frost cuts it down each winter, only for it to grow up fresh and strong again the following

A selector's camp on Yarram Creek twelve months after the scrub was fired. The upper portion of the hill has cocksfoot, rye-grass, and white clover, in many places waist high. One of the many waterfalls is seen in the foreground.

spring. It is looked upon by many as the worst of the weeds, and most difficult to eradicate. Brushing will not destroy it. The plants seem to sprout out again with renewed vigour, and the roots rapidly thicken and develop to several inches in diameter.

As a matter of fact, the inkweed is one of the least objectionable. There is only one method of dealing with it—prevent it from seeding by cutting

down with the brush-hook, and then as opportunity and time allow cut the plants out by the roots, well below the surface of the ground, with a mattock.

Other weeds that are plentiful are dogweed, Cape gooseberry, thistle, sorrel, and dandelion

Stocking.

Six months after planting there will be sufficient young grass to carry a limited number of young stock, and at the end of another twelve months the pastures will be well established, and ordinary stock may be carried.

On newly-grassed areas, stock frequently injure themselves by attempting to get over logs or stumps which are partly or completely hidden by long grass or weeds. Much of this trouble may be averted by carefully examining such areas prior to stocking, and removing any dangerous portions of timber likely to cause injury.

All new grass areas should be lightly stocked till a good sward is obtained. For eight months of the year feed is plentiful, but during June, July, August, and September, it is scarce. The stock-carrying capacity of the land may be put down at 1 cow to 2 acres, *i.e.*, relying on the ordinary pasture. At the same time, there are several months when the feed cannot be kept down with heavy stocking. September is the hardest month, but the difficulty experienced during the winter and early spring can be readily overcome by cultivating a portion of the land, growing suitable feeds, and conserving them in the form of silage. Until some such provision is made, dairymen must suffer losses by having diminished milk returns.

Notwithstanding the cold and somewhat severe winters, stock generally on the Dorrigo look well compared with other localities. This is largely due to the bracing climate, and the richness of the pastures.

Cultivation.

From time to time advantage should be taken of suitable weather to clean up the paddocks by burning the decaying logs and stumps, and eradicating weeds. In four or five years most of the roots will have decayed, and the land may be roughly ploughed. The district will never be an extensive agricultural one—a large proportion of it is too hilly for cultivation. However, where the plough can be used, maize, potatoes, mangolds, swedes, peas, vetches, pumpkins, and onions may be grown, and oats, wheat, barley, and rye for green feed. The climate is too moist to make hay on an extensive scale. Garden vegetables of all descriptions grow to perfection, as also apples and other cold climate fruits.

The value of well improved farms may be set down from £12 to £20 per acre. Rents range from 15s. to 17s. 6d. per acre.

Progress of the District.

In the town of Dorrigo there is a population of 500, and in the Dorrigo district, exclusive of the town, in the police patrol extending from Bobo to Deer Vale, and from Mountain Top to Tyringham, 1,100. Besides the

usual business places—stores, banks, hotel, boarding-houses, blacksmith, wheelwright, and public offices—an up-to-date joinery works has been established. The building trade has been very brisk. Nearly half of the business portion of the town has been burnt out as the result of two fires occurring within twelve months of each other. The first exhibition of the newly-formed Agricultural Society was held last year.

A representative of a Victorian firm of nurserymen systematically canvasses the scrub and secures orders for fruit trees almost before the selector runs his first fire. The freight on general merchandise from Dorrigo to Bellingen is 15s. per ton, from Bellingen to Dorrigo £2 per ton.

The District Surveyor of Kempsey has supplied me with the following information :—Approximate area of Dorrigo plateau, 158,000 acres. Areas alienated :—Conditional Purchase Lease, about 55,000 acres; Homestead Selection, about 9,000 acres; Conditional Purchase and Conditional Lease, about 7,000 acres. Of the unalienated lands about 8,000 acres are now available for ordinary selection. (This is very rough country) About 55,000 acres are covered by classification reserves awaiting inspection and subdivision ; about 21,000 acres are within forest reserves ; and the balance, about 3,000 acres, is covered by other reservations.

As a tourist and health resort, it only requires better and quicker means of communication and publicity to make it popular. The construction of the railway will not only assist in this direction, but also enable many products, including fruit and vegetables, to be grown and marketed at a profit.

Lectures by Departmental Experts.

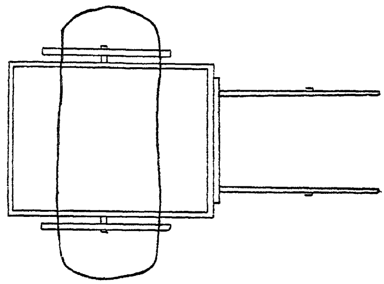
Mr. Max Henry, M.R.C.V.S., Government Veterinary Surgeon, recently lectured at Casino on "Diseases of Cattle"; at Bangalow on "Conformation and Unsoundness in Horses"; and at Murwillumbah on "Contagious Abortion and Mammitis," with demonstration. The attendance at Casino was very poor, at Bangalow fair, and at Murwillumbah good.

Now this does not reflect credit upon Casino farmers. It is true that a dairy farmer does not need to be a veterinary surgeon; but knowledge is no weight to carry, and these lectures deal with subjects in which every dairy farmer is financially interested. The Government provides such information free of cost, in the interest of the State, and it is in the interest of the State as well as of themselves that farmers should understand the diseases which are likely to attack their dairy herds.

We therefore urge farmers to make an effort to attend these and similar lectures by Departmental experts. The lectures are being arranged in various districts, and are duly advertised in the local press. Where a Branch of the Agricultural Bureau has been established, the lecture is delivered under its auspices. Put on your coat and come.

A Cheap Silage Stack.

Mr. J. W. Shephard, Gobbagombalin Stud and Dairy Farm, Wagga, has supplied the accompanying photograph, showing a labour-saving and rapid method of building a silage stack by means of a horse and double and single pulleys. About 35 feet of 1-inch rope is needed for the dray, knotted, and placed in the bottom of the empty vehicle, as shown in the sketch. When the load is pulled in alongside of the stack, the loop is brought up on each side and hooked into the single block; the double one being already fastened to the limb of the tree to give sufficient height to land the load bodily on top of the stack. The stack, as illustrated, is 27 feet high.



Method of placing the rope in the dray.

If the horse was not a staunch one with some weight, it would be necessary to have another pulley near the ground to keep the draught low; but Mr. Shephard's horse did not seem to suffer any disadvantage, and could pull from any side, thus assisting in landing the load on any part of the stack.

Mr. Shephard does not favour stack ensilage, except when there is not time to excavate a pit, as happened in this case. He considers the pit the best form of ensilage, as there is practically no waste, it is easy to fill, and the stuff can be tramped well with the horses; and he regards the close tramping as the most important part of silage making. Many of our inland readers will agree with him; but make sure that the position is dry, and the subsoil of a non-porous nature.

A Cheap Silage Stack. Lifting the forage.

"NEW SOUTH WALES STRONG WHITE."

At the request of the Sydney Chamber of Commerce, 80 lb. samples of Comeback wheat, grown at Bathurst, Wagga, and Cowra Experiment Farms, and Bobs from Cowra and Wagga Farms, were supplied by the Department of Agriculture, and weighed by Mr. F. B. Guthrie in the presence of some members of the Grain Trade Section of the Chamber, on 14th February, 1911. The samples were weighed on beam scale with McGuirk's patent attachment, exactly as in the calculation of the f.a.q. standard. The results were as follow:—

Variety.	Farm.	Weight per Imperial bushel.
		lb. oz.
Comeback	Bathurst	66 $8\frac{3}{4}$
Do	Wagga	66 $3\frac{1}{2}$
Do	Cowra	66 $8\frac{3}{4}$
Bobs	Cowra	65 4
Do	Wagga	65 $8\frac{1}{2}$

The average weight is 66 lb. per imperial bushel.

The f.a.q. weight for West and South wheats of various kinds grown was arrived at under similar conditions on the 13th February, as $62\frac{1}{4}$ lb.

The Chamber states that the considerable difference in weights shows the advantage of growing these hard, white wheats.

The officers of this Department consider that in fixing the standard upon the principle of the heavier the wheat the better the quality, the Chamber is adopting a trade convenience which is not sound. As Mr. Sutton pointed out at the Wheat-growers' Conference last year, Allora Spring is one of the heaviest wheats, but one of the worst from a milling point of view. Still, the weights given show that our strong, white wheats are heavier per bushel than the f.a.q. standard, and that even if weight per bushel is to determine the market value of wheats, they are well in the lead. The Department wishes these wheats to be regarded as of greater value than those more generally grown, *because they yield flour of better strength.* When their greater value is recognised and paid for, they will be extensively grown, and will enhance the reputation of New South Wales wheats. That is why it is desired that they should be kept apart from the f.a.q. standard, and known as *New South Wales Strong White.*

The "Ulax" Milk Strainer.

Messrs. Moffat Virtue, Limited, 7 Bent-street, Sydney, have drawn the Department's attention to this strainer, made by the Crown Separator Company, Sweden, and for which they are agents. There is no doubt that the principle is an excellent one, and that the strainers will be an advantage to milk suppliers; but they will need to be properly used and kept thoroughly clean.

Farmers' Experiment Plots.

WHEAT EXPERIMENTS, 1910.

NORTHERN DIVISION.

GEORGE VALDER, Chief Inspector of Agriculture.

EXPERIMENTS were again conducted in the Northern Division with varieties of wheat. There were in all fourteen experiment plots; the total area of each ranged from 2½ to 7½ acres, and from ¼ to 1 acre was allotted to each variety.

The names and addresses of the experimenters are as follow:—

W. Palmer	Pine Grove, Narrabri.
Seth Forge	Tamworth.
G. A. Arkinstall	Inverell.
W. Tonkin	Garfield Farm, Little Plain, Delungra.
E. Young	Carara, Curlewis.
F. A. Porter	Kelvin.
J. H. Hayes	Pallamallawa.
George Smith	Wee Waa.
Smith Pollock	Gaspard-road, Quirindi.
Sylvester Browne	Singleton.
J. J. Haywood	New Mexico, Manilla.
W. J. Higinbotham	Tilbuster, Armidale.
J. F. Chick	Homestead, Tenterfield.
D. J. Wangman	Pilliga Scrub.

The season 1910 was not nearly as satisfactory as that of the previous year. In many parts the spring was a dry one; and this was followed by heavy frosts, which in several of the districts caused serious loss, the crops having either to be fed off with sheep or cut for hay.

Again, in some districts the late rains caused rust to appear, thus considerably reducing the yields—Bunyip, Bayah, and Federation especially suffered in this respect.

As in other districts the yield was affected in consequence of the seed being treated with bluestone and salt. In some of these cases the germination was very poor; in others, however, where the moisture in the soil was fairly well maintained, the germination was good.

In the case of the Wee Waa plot, the seed was sown broadcast on land that had not been ploughed after the previous crop but was twice worked with a cultivator. The results, under the circumstances, were satisfactory, but it is certain that, with better cultivation, very much higher yields would have been obtained.

At both the Kelvin and the Pallamallawa plots, birds interfered with the crops: and heavy winds, prior to harvesting, caused considerable loss in the case of the Inverell experiments.

It was noticed that, in some instances, the later-maturing varieties were not so badly affected by frosts.

The results obtained from the various plots are given in Table I.

It will be noticed from these figures that the yields from the varieties selected by the farmers were lower in every instance than the best of the Departmental varieties. Marshall's No. 3 and Cleveland gave the highest returns in two instances, and the following varieties each gave the highest yield in one plot, viz.:—Warren, Florence, John Brown, Bunyip, Yandilla King, and Bobs. The highest average yield of the wheats grown in five or more plots was given by Yandilla King, viz.: Five trials, with an average of 14 bushels 18 lb., although, in one instance, this variety gave as high as 20 bushels 40 lb. The next highest was Comeback, with an average of 12 bushels 50 lb. for ten trials, while in individual cases this variety yielded 16 bushels 48 lb., 17 bushels 32 lb., and 18 bushels 32 lb. These figures show what a serious loss was occasioned at various plots through poor germination, frosts, &c., as already explained.

In addition to the variety trials, manurial tests were also carried out. One plot was sown with superphosphate at the rate of 56 lb. per acre; one with superphosphate and sulphate of potash at the rate of 42 lb. superphosphate and 14 lb. sulphate of potash per acre; while a check plot was sown without manure. In all except two instances, the application of superphosphate showed an increase ranging from 44 lb. up to 4 bushels 18 lb. In two instances the yield was lower, but in one of these the difference was due to the fact that the superphosphate plot included old roads. It was unfortunate that this position should have been chosen for the experiment.

Superphosphate and potash gave a better return in six cases than superphosphate alone, but the quantity in five instances was only from a few pounds up to 1½ bushels. In the sixth plot the increase was nearly 4 bushels, but this was due to the yield in the superphosphate plot being low, owing to the presence of old roads as already explained. In three plots, the yield was from a few pounds to 1 bushel lower. Comparing the results with those of the unmanured plots, we find that in seven plots the returns were higher, varying from a few pounds to 5 bushels 48 lb. In the other two cases the yields were a few pounds lower. The inference deduced from these figures is, that in the majority of soils in the north it does not pay to use potash. This inference needs to be further substantiated, and for this purpose further experiments will be conducted on the same lines during the coming season.

TABLE I.—Northern District Wheat Plots, 1910.

Variety.	Narrabri.	Tamworth.	Inverell.	Delungra.	Curlewis.	Kelvin.	Wee Waa.	Singleton.	Manilla.	Tenterfield.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bayah	9 52	6 30	...	...	5 38	18 4	...	...	7 18	...
Bobs	...	...	...	...	...	...	23 25	9 30	...	...
Bunyip	17 6	9 51	...	...	8 6	15 54	12 52	13 40	8 29	...
Cedar	...	...	...	...	...	...	14 29	...	...	...
Cleveland	...	...	8 30	20 2	...	...	...	...	...	21 0
Comeback	16 48	12 45	6 0	8 44	7 18	18 32	15 16	13 56	17 32	11 30
Federation	9 38	7 30	...	...	7 54	...	14 27	8 20	9 18	...
Firbank	...	...	...	...	...	15 6	...	...	...	...
Florence	...	13 57	...	...	7 42	...	...	...	...	...
Genoa	...	...	5 38	13 27	...	...	...	...	...	...
Haynes' Blue Stem	...	...	...	12 8	...	...	...	...	...	13 40
John Brown	...	...	8 32	9 54	...	...	14 15	13 52	...	...
Jonathan	...	...	...	9 50	...	...	...	...	...	13 0
Jumbuck	...	...	...	...	...	...	16 24	...	...	...
Marshall's No. 3	...	...	...	...	...	...	...	16 6	20 3	...
Rymer	...	7 57	...	...	...	15 48	17 14	...	15 42	...
Steinwedel	...	...	...	...	...	...	...	10 36	...	...
Thew	...	...	...	...	...	...	...	15 2	...	...
Warren	18 14	...	...	...	...	...	...	...	...	...
Yandilla King	...	11 24	...	...	5 26	20 40	...	...	13 33	...
Zealand	...	...	...	...	...	...	...	11 12	...	...
Farmer's Variety	10 45	7 12	...	13 36	7 34	15 32	...	...	...	...

MANURE TRIALS.

	Narrabri.	Tamworth.	Inverell.	Delungra.	Curlewis.	Kelvin.	Wee Waa.	Singleton.	Manilla.	Tenterfield.
No manure	6 16	6 30	6 56	9 50	7 54	16 54	...	4 2	17 32	13 0
Superphosphate	9 52	8 42	5 30	10 44	8 6	18 14	...	8 20	14 42	13 40
Superphosphate and potash	9 48	8 30	6 48	11 24	8 20	19 56	...	9 50	18 13	12 40

SOUTHERN DIVISION.

H. ROSS, Inspector of Agriculture.

THE harvest returns under review represent the work done for the second year in connection with the Farmers' Experiment Plots. As was the case last season, areas of about 10 acres were set aside for the experiments, the respective plots for each variety ranging from ½ to 1 acre in extent. Plots have now been established in nearly every wheat-growing locality in the southern district.

The experiments for the past season comprised trials of varieties of wheat for hay, trials of grain varieties, and manurial tests.

Hay Trials.

WHEAT.—Yields per Acre.

Name of Experimenter.	Firbank.	Steinwedel.	Zealand.	Comeback.
	tons cwt. qr.	tons cwt. qr.	tons cwt. qr.	tons cwt. qr.
M. J. Carew, Deniliquin	1 12 2	....	2 17 3	2 4 2
G. Laidlaw, Albury	2 1 1	2 9 3	1 16 2	....
J. Bowen, Ganmain	3 2 0	2 10 2	3 10 0	....
Hulme Bros., Germanton ...	1 17 1	1 3 3	1 18 3	... .
S. P. Wilson, Jerilderie	1 6 1	....	1 2 2	....
S. A. Steane, Cooma		Destroyed by frost.		
Jindabyne West Estate, Jindabyne ...		Destroyed by frost.		
Average yield	1 19 3	2 1 1	2 5 0	2 4 2

OATS.

Experimenter: M. J. Carew, Deniliquin.

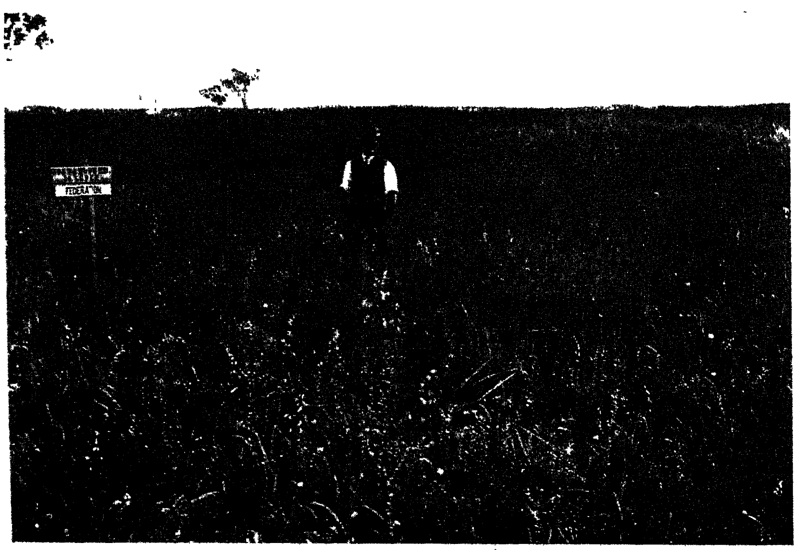
Variety.	Yield per acre. tons cwt qrs.
Algerian	3 10 2
Carter's Royal Cluster	3 10 1
Abundance	3 1 1
White Tartarian	2 4 3

In the trial of varieties of wheat for hay, Zealand has given the best results At Ganmain this variety yielded 3 tons 10 cwt. of hay per acre, with a rainfall during the growing period of the crop of 1,182 points. At Deniliquin, where only 879 points of rain were recorded between the time of sowing and harvesting, Zealand yielded 2 tons 17 cwt. 3 qrs. of hay per acre. It is a very free-stooling wheat, producing hay of excellent quality and good colour. It is late in maturing, and this fact detracts somewhat from its value as a hay wheat, as in some cases the hay-harvesting operations would hardly be over before the early maturing grain varieties would require the farmer's attention.

Zealand Wheat on Ganmain Plots. Yield, 3 tons 10 cwt. of Hay per acre.

Firbank Wheat on Ganmain Plot. Yield, 3 tons 2 cwt. of Hay per acre.

Bayah Wheat on Albury Plots.



View of a Non-fallowed Plot in Albury District, showing poor growth.

Firbank exceeded the yield of Zealand only in one instance. It becomes fit to cut for hay fully fourteen days ahead of Zealand, and this must be deemed a considerable advantage. Both quality and colour of this variety are excellent. It is one of the best varieties the farmer can use for sowing around the grain crops or on the headlands. Not only will it yield a good bulk of choice quality hay, but it will also enable him to cut his fire-breaks fully a fortnight earlier, thus minimising the risks of fire, and to also have the hay-making finished before the early-maturing varieties of wheat are ready to strip.

In quality, Steinwedel did not come up to the standard of either Zealand or Firbank; the straw is harder, and too much dry flag is present. In every plot in which Steinwedel was sown a good deal of smut could be detected.

Grain Trials.

In the trial of the various varieties of wheat for grain, *Federation* again clearly showed its superior yielding qualities. Individual yields of 37 bushels 17 lb., 34 bushels 48 lb., 31 bushels, and twice over 30 bushels per acre, were obtained. The average yield for eight trials in fields situated from Albury to Goulburn and from Wyalong to Jerilderie, thus embracing nearly all kinds of wheat-growing soils in the southern district, was no less than 28 bushels 3 lb. This variety withstood splendidly the severe windstorms experienced this season before and during harvest time. It stripped easily, and yielded a good sample of grain.

Rymer, which yielded consistently well last year, again upheld its reputation. While no very large individual yields were recorded, still the average yield in the trials is the very fine one of 27 bushels 29 lb. per acre.

Marshall's No. 3 and *Yandilla King* gave encouraging results. The former yielded up to 37 bushels 51 lb.; the latter up to 34 bushels 18 lb. per acre. Both these varieties are good dual purpose wheats, suitable for either grain or hay, and can be confidently recommended for an early sowing.

Comeback and *Bunyip* yielded consistently, especially where not sown too early.

Among the cool climate wheats, *Cleveland* yielded 30 bushels 26 lb. at Tarago, near Goulburn; but even in this district Federation easily headed the list with 37 bushels 17 lb. per acre.

The following table compares the yields obtained from varieties recommended by the Department with those obtained from the farmers' own seed :—

Locality.	Variety recommended by Department.	Yield.	Farmer's Choice.	Yield.
		bus. lb.		bus. lb.
Ganmain	Comeback	34 6	Purple Straw ...	29 9
Germanton	Marshall's No. 3 ...	33 36	Dart's Imperial ...	24 28
Wyalong	Federation	30 11	Red Straw	21 49
Goulburn	Federation	37 17	Dumpty	22 0
Average	Variety recommended by Dept.	33 47	Farmers' Choice ...	24 21

TRIAL of Varieties of Wheat for Grain.—Yields per acre.

Name of Experimenter.	Federation.	Yandilla King.	Marshall's No. 3.	Rymer.	Bunyip.	Comeback.	Florence.	Bobs	Bayah.	Jonathan.	Cleveland.	Farmer's Variety.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.
Mimosa Station, Temora	34 48	34 18	37 51	31 57	24 17	23 54	23 34	......	.....	...	...	.....
John Bowen, Ganmain	31 21	......	......	26 35	27 34	34 6	31 43	25 40	......	......	...	29 9
Hulme Bros., Germanton	25 47	....	33 36	......	26 45	28 40	......	.....	29 34	....	......	24 28
Gagie Bros., West Wyalong ...	30 11	26 22	......	......	23 5	....	21 26	......	24 32	......	......	21 49
E. Murphy, Harden	30 16	......	22 3	23 45	18 0	21 0	16 22	......	......	....	......	......
Garraway and Allen, Tarago ..	37 17	......	......	27 40	21 48	26 51	......	25 15	....	23 15	30 26	22 0
S. P. Wilson, Jerilderie	19 48	Cut for hay.	15 8	......	.....	13 6	11 55	....	....	......	.....	......
G. Laidlaw, Albury	14 59	15 51	.....	......	.....	......	17 7	...	14 0	....	..	13 22
A. Eulenstein, Henty	Cut for hay.											
Average Yield per acre	28 3	25 30	27 9	27 29	23 34	24 36	20 1	25 27	23 43	23 15	30 26	22 9

Manure Tests.

Name of Experimenter.	No Manure.		56 lb of Superphosphate per acre		42 lb. of Superphosphate and 14 lb. of Sulphate of Potash per acre.	
	bus	lb.	bus.	lb.	bus.	lb.
T. Bowen, Ganmain ...	20	10	30	15	24	0
Hulme Bros., Germanton ..	19	47	26	45	26	8
Mimosa Station	29	39	34	48	36	40
E. Murphy, Harden	20	5	24	38	24	57
Do do	25	47	29	15	30	16
Garraway and Allen, Tarago ...	29	11	37	17	36	0
Average yield	20	44	30	29	29	40

The results from the manure tests again furnish abundant evidence of the necessity for using phosphatic manures in the southern wheat-growing districts. The average difference between the plots treated with 56 lb. of superphosphate per acre, and those without manure, is no less than 9 bushels 45 lb. per acre—that is, an increased yield worth over 30s. per acre, for an outlay of approximately 2s. 6d. per acre.

The addition of a small quantity (14 lb.) of sulphate of potash per acre has again given negative results, and it may be assumed that most of our wheat-producing soils in this district contain, for the present, a sufficiency of potash for cereal production.

Conclusion.

Reviewing not only this year's, but last year's results from the Experiment Plots, it will be seen that the yield is considerably more than double the average for the State, and is in most cases higher than the yield obtained by neighbouring farmers under similar soil and climatic conditions. The farmer naturally and pertinently asks the question why such is the case. It may be suggested that the experiment plots are situated on a particularly good piece of land. This, however, is not so, for they are established on an average piece of land representative of the soil in the district, and in nearly all cases are a corner of a big cultivation paddock. What factors, then, are responsible for the increased yield?

The answer is, the same factors which have been responsible for successful wheat-growing right throughout New South Wales, *i.e.*, good cultivation methods, the sowing of the most suitable varieties of graded seed, and a system of manuring.

Despite the large advance which has taken place in wheat-farming in recent years, I have no hesitation in saying that not more than 10 per cent. of all our wheat-growers cultivate the land as it should be cultivated. Fallowing is resorted to almost right throughout the southern district; but how many farmers are there who give the fallowed land the frequent and necessary working with harrows or cultivator during the summer months? The fallowed land is allowed to lie for months without being worked; it is allowed to become caked on top; weeds are allowed to grow; and only just before sowing commences the fallow is worked up again with a cultivator.

In the meantime, the all-important moisture in the soil has escaped. Not so in the experiment plots; here the land receives a few extra strokes of the harrow, or an extra cultivating, during the summer months at a cost of from 2s. to 3s. per acre, which is responsible for an increased yield worth from £1 per acre upwards. This is one of the chief factors responsible for the extra yield obtained in the plots.

Let us impress upon wheat-growers not to become careless in their cultivation methods, nor to be over-confident on account of the last two prosperous seasons which have been experienced in the south. Whether the seasons be good or bad, it is only the man who employs the best cultivation methods who can hope to obtain the best results. Let the fallowed land be worked whenever there are signs of a hard crust forming on top, so as to keep a loose surface mulch; let only the most profitable varieties of graded seed be sown. Let this be combined with a judicious use of fertilisers, and a fair share of success is assured.

Comeback Wheat on Ganmain Plots. Yield, 1 ton 14 cwt. 6 lb. of Hay per acre.

WESTERN DIVISION.

MARK REYNOLDS, Inspector of Agriculture.

THIS year the experimental plots with wheat in the Western Division numbered fifteen, from four of which no returns were obtained, as the wheats were destroyed by severe frosts following dry weather.

The size of the blocks varied from ½ acre to 1 acre in area, according to the size of the paddocks available, and the total area of each experiment ranged from 7 to 19 acres.

The majority of the plots of land had previously been under crop for many years, others for two to three years, while in one instance only was the land new. In most cases the land was well cultivated; but in a few instances the cultivation was not quite as thorough as it should have been.

The names of the experimenters and the localities are as follow:—

P. O'Neill	Narromine.
R. M. Diggs	Gilgandra.
W. Magill	Bogan Gate.
R. Ezzy...	Millthorpe.
J. Clarke	Dapper, *via* Gulgong.
Young and Ralli	Young.
A. and P. Society	Orange.
H. Heavener	Blayney.
J Balston	Stony Creek, Mudgee.
E. J. Lowe	Birriwa.
Iram Nash	Parkes.
Major Barton	Maryvale.
C. J. Maslin	Grenfell.
N. Miller	Cumnock.
Arthur Croft	Bellambi, Gulgong.

The seed-bed for early sowing was generally dry, and that for mid-season to late sowings moist.

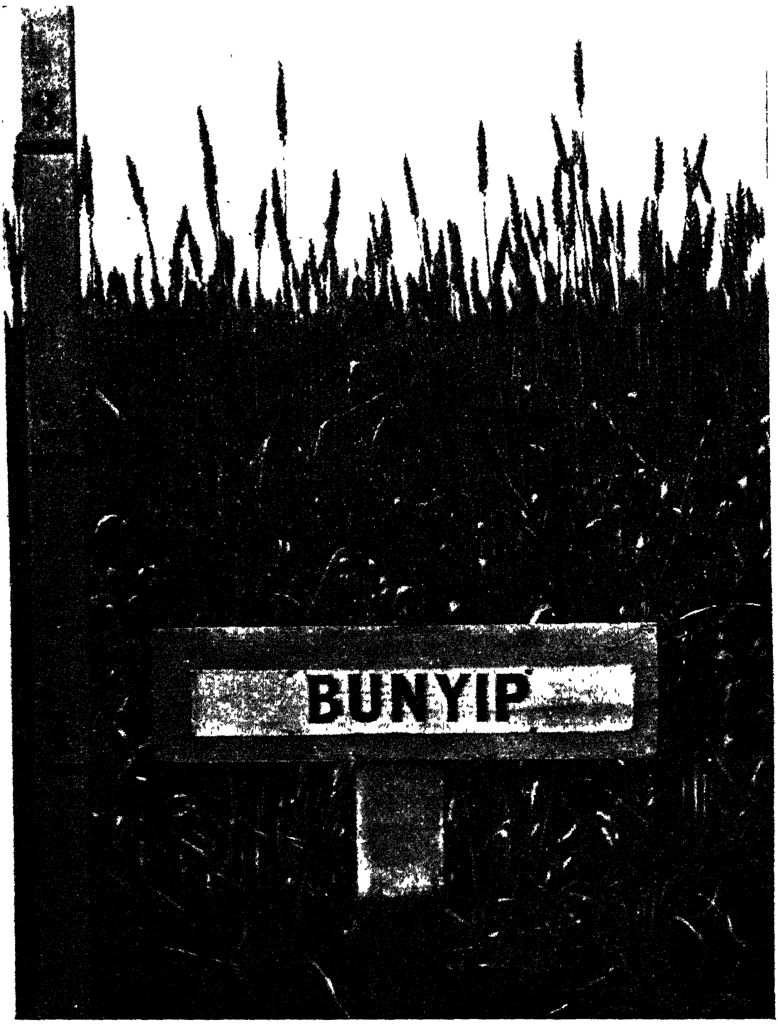
As usual, the seed was put in with seed drills, of which quite a variety of makes were used. It was noticed that where the soil was rough, in consequence of the dry weather not allowing the clods to be broken up, the disc drill did not work as well as the hoe drill.

Prior to sowing, the seed sent out by the Department was treated with bluestone and salt, whereas the farmers' seed was treated in some cases with bluestone and salt, bluestone and lime, bluestone, and formalin.

Unfortunately, in the majority of instances, the bluestone and salt treatment badly affected the germination of the seed, and, as a result, in some few cases the farmers' seed, which came up thickly, gave the heavier yield. It is very unfortunate that this occurred, as it is almost impossible to make a fair comparison; and in order to prevent any further difficulty of this kind, the wheats during the coming season will be treated with bluestone and lime. The conclusion arrived at is that, in some instances, the salt absorbed moisture, and caused the wheats to germinate quickly in soils which were somewhat deficient in moisture, and owing to the dry weather, there was not sufficient moisture to keep the young plants alive, whereas seed not treated with salt germinated more slowly, and benefited by showers which eventually fell.

During the growth of the crops, it was noticed that Steinwedel appeared to be more affected with smut than the other varieties, and Bayah, Federation, and Steinwedel more subject to rust, while Comeback appeared to suffer badly from dry weather tip.

In cases where the germination was poor, most of the wheats stooled well, with the exception of Bunyip, Comeback, and Florence, and formed very fine ears, thus helping to compensate for the shortage of plants.



Bunyip Wheat at Maryvale, Wellington.

The thinness of the crop, in some few instances, resulted in a weed growth very detrimental to the returns, and in other cases strong winds during harvest time materially reduced the yields. Birds of the parrot family also assisted to reduce the yield.

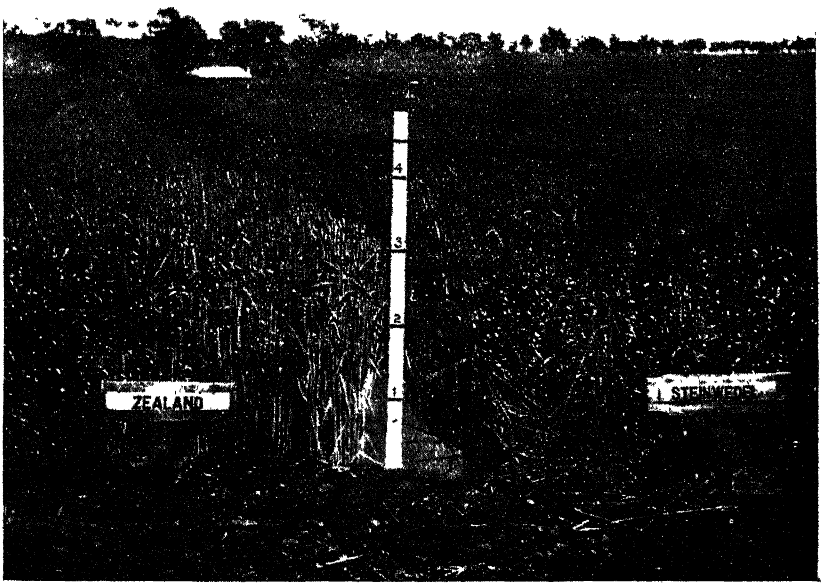
Some few of the crops in the west were affected by the prolonged dry spell in the spring, followed by severe frosts up to as late as 12th October.

In the plot at Bogan Gate, mildew appeared in the early wheats on the lower portions of the stems in the autumn.

In the Millthorpe plot, harvesting was delayed a fortnight owing to the late rains. During this time a strong growth of "Fat hen" (*Chenopodium*

album) appeared, which gave trouble in the harvesting of the wheats, and caused a loss of varying quantities of grain.

The appearance of this weed in the wheat was a surprise to the farmer. The seed must have been carried by birds and animals from other portions of the farm, and the wet and humid conditions of January favoured germination and rapid development of the plants.



View of Maryvale Experiment Plots, showing arrangement in long, narrow strips.

The returns of the crops harvested for grain are given in Table II.

From this table it will be seen that the wheats classed as Purple Straw in no case gave the highest yield. The heaviest yields were given by Bobs and Rymer in three instances each, and in one case each by Genoa, Federation, Yandilla King, Comeback, and Bayah. With both Steinwedel and Firbank the returns were unsatisfactory, as these wheats lodged. Bobs, Federation, Bunyip, and Comeback yielded very satisfactorily in all the plots in which they were sown, with the exception of the three situated in the very hot and dry districts. As already explained, the poor yields in these cases were due to the poor germination and adverse season. The returns from the plots compared favourably with good district returns in a number of instances, and in a few instances were considered the best crops in the districts. With the attention that was given to fallowing and after-cultivating in most instances, had the germination been satisfactory, yields equal to last season would have been recorded.

Table II.—Western District Wheat Plots, 1910.

Variety.	Maryvale.	Parkes.	Grenfell.	Young.	Bogan Gate.	Narromine.	Gilgandra.	Cumnock.	Mudgee.	Blayney.	Orange.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bayah	11 36	...	20 55	27 8	11 16	9 11	11 10	...	...	...	...
Bobs	...	19 20	...	...	12 34	10 38	...	23 20	...	20 50	43 30*
Bunyip	16 15	15 38	18 22	19 14	3 28	9 22	12 6	...	...	...	...
Cedar	11 54	...	...	...	...	...	...	...	...	...	...
Cleveland	...	...	...	...	...	...	...	...	12 57	23 0	...
Comeback	18 17	16 14	19 55	15 45	9 52	7 17	9 0	...	...	18 55	22 3
Federation	15 8	18 47	19 2	27 40	13 52	9 26	13 12	...	...	...	...
Florence	16 53	16 57	20 42	18 26	7 8	6 34	9 28	10 30	...	...	...
Firbank	...	8 26	...	4 20	...	...	...	...	...	...	...
Genoa	...	...	...	...	...	...	...	...	12 17	19 55	...
Haynes' Blue Stem	...	...	...	...	...	...	...	...	...	14 15	20 0
Jonathan	...	...	...	...	...	...	...	...	...	18 45	...
Marshall's No. 3	...	19 43	...	...	...	...	...	...	...	...	...
Rymer	12 28	22 9	...	...	17 28	...	...	...	18 37	...	...
Steinwedel	7 28	...	...	12 54	...	...	...	...	...	...	...
Yandilla King	...	...	...	29 12	...	...	...	...	16 48	...	...
Zealand	11 54	...	18 24	15 21	...	...	...	...	...	...	...
Farmer's Variety	15 20	21 3	...	...	...	...	11 48	18 54	15 2	19 26	...

Manure Trials.

	Maryvale.	Parkes.	Grenfell.	Young.	Bogan Gate.	Narromine.	Gilgandra.	Cumnock.	Mudgee.	Blayney.	Orange.
No manure	10 54	15 2	10 4	16 53	13 52	8 52	...	18 50	11 19	18 5	...
Superphosphate	15 8	18 47	18 22	15 45	13 52	9 26	...	23 20	12 57	18 45	...
Superphosphate and potash	13 33	18 43	18 58	18 58	14 16	8 46	...	20 17	12 11	19 10	...

* With reference to the high yield of Bobs on the Orange plots, the season was apparently very suitable for this variety, and it comes out the heaviest crop not only in this district, but in the whole of the State. The other varieties on the Orange plots suffered severely from shelling, through storms coming at a critical time, and also from poor germination.

In addition to the variety trials, a manurial experiment was carried out. Plots were sown without manure, others were treated at the rate of, approximately, 56 lb. superphosphate per acre, and others, again, with 42 lb. superphosphate and 14 lb. sulphate of potash.

The results in most of the trials was decidedly in favour of superphosphate. Increased yields as high as 8 bushels per acre were obtained, while only in one instance was the return lower than that from the unmanured plot. The returns of the plots treated with superphosphate and potash were, however, not in favour of the extra expenditure; while the yield was only below the unmanured in one instance, it was less that the yield of the superphosphate plots in six instances, and in only one showed an increase of an appreciable amount.

WINTER FODDER CROPS ON THE NORTH COAST.

GEORGE MARKS, Inspector of Agriculture.

WITH the object of testing a number of varieties for winter green feed, experiments were planted at Grafton and Wollongbar Experiment Farms last autumn. These consisted of wheats, oats, ryes, and barleys. On account of the continuous heavy rains the land could not be prepared till late in the season, so that the results are those of a late planting. At Wollongbar, the weather conditions during growth were more favourable than they were at Grafton, where the wet weather was followed by an unusually dry spring.

The following tables give the names of varieties and their yields:—

VARIETY TRIALS.

Variety.	Grafton.			Wollongbar.		
	tons	cwt.	qrs	tons	cwt.	qrs.
Wheats—Huguenot	1	16	0	6	13	2
John Brown	2	1	1	4	0	2
Medeah	2	8	2	7	5	1
Thew	1	17	3	4	6	1
Uppercut	1	10	2	3	1	3
Warren	2	1	0	...	...	...
Barleys—Skinless	1	12	1	2	11	0
Cape	1	15	0	5	2	0
Ryes—White	0	13	2	6	5	2
Black Winter	2	3	0	6	18	1
Oats—White Tartarian	1	4	1	3	2	3
Carter's Royal Cluster	1	4	1	2	15	0
Potato	1	12	1	2	8	0
Abundance	1	17	3	2	8	0
Algerian	1	7	0	6	11	2

MANURIAL TRIALS.

Wheats—Bonedust	2	0	2	6	7	2
No manure	2	11	1	7	1	1
Superphosphate	2	8	2	7	17	0
Oats—Bonedust	1	12	1	5	11	3
No manure	1	15	0	5	4	0
Superphosphate	1	7	0	6	11	2

While too much reliance cannot be placed on the results of a single season, particularly one so unfavourable in many respects, still certain deductions can be made, and these are of value in arranging future experiments. Of these crops it would appear that barley and the coarse late-maturing varieties of oats are totally unsuitable, compared with Algerian oats, rye, and wheat. Algerian oats, though rust-resistant, cannot be relied upon to produce a clean crop. Some of the wheats rusted rather badly, but several were absolutely clean, and produced a large amount of green feed.

It would seem that better results in clean crops can be obtained from certain wheats, particularly those of the macaroni type. These, however, develop a harshness on approaching maturity, and consequently require to be fed, or converted into hay, while well on the green side.

The variety trials were manured at the rate of 1 cwt. of superphosphate per acre. In addition to the foregoing, plots of wheat and oats were manured to show the results of bonedust as against superphosphate. The superphosphate gave the better returns at Wollongbar, but at Grafton the dry weather interfered with the growth, so that it would be unfair to make comparisons.

Of the wheats, Medeah, Thew, Warren, and Huguenot are worthy of further trials, also the ryes and Algerian oats. Thew and Warren gave every appearance of making splendid hay-wheats for the coast, the former being very early.

FODDER CROPS ON THE SOUTH COAST.

R. N. MAKIN, Acting Inspector of Agriculture.

WEATHER conditions were much against a satisfactory germination of seed sown for winter experiments in 1910. During April, May, and the greater part of June, the weather was very dry; then followed a heavy fall of rain, in which somewhere about 10 inches were registered at Berry. So heavy was the fall that the water backed up and caused a flood, totally submerging the Stud Farm plots for several days. Another spell of dry weather followed during August, September, and October. The Stud Farm plots never recovered, and many blocks were ploughed under.

Wheats.

Of the wheat blocks, the only one that showed up at all was John Brown, which gave a return of 8¾ tons of green fodder. This wheat did very well at Berry last season (1909), and in this season's experiments it has topped other varieties in most instances. At Pambula it was beaten by Thew. A block of 1¼ acres of John Brown, at Bombala, looked remarkably well throughout the growing period; in this case the crop was saved for seed, and gave a return of 25 bushels per acre.

From this season's experiments, it is evident that John Brown wheat can safely be recommended to farmers on the South Coast, both for green fodder and for hay. It is a strong grower, but not as early as Thew. It grows evenly and resists rust very well. A plot of 1 acre of this variety growing at Unanderra, presented a fine sight. It was allowed to mature its seed, and an excellent sample of grain was secured. The *Wollongong Mercury*, commenting on the plot, said:—"Such a crop has not been seen in the district for a number of years." It is hoped that the coming season will give further proof of the value of this wheat.

John Brown Wheat at Bombala.

Thew wheat upheld its reputation at Kangaroo Valley, by coming out top with a return of 8 tons of green-stuff per acre. The seed of this variety was saved from last season's experiments, and was sold to local farmers; and from what I have learnt, excellent results were obtained. This is the quickest growing variety so far tried on the plots. Sown early in March, one may look forward to cutting it in June. At Kangaroo Valley it attained a height of 6 feet in four months when sown early.

Farmers would do well to grow this wheat for early feed, and to sow peas or tares with it. Most farmers sow Algerian oats, but for early feed Thew wheat generally gives a better crop.

Warren wheat did not give the results expected. At Pambula it did very well, but did not appear to stool as well as other varieties.

Huguenot and Medeah were disappointing as regards their value as fodders. They are poor stoolers, and do not run up as quickly as other varieties. Some small parcels of wheat, in which these two varieties were included, were sent to Mr. W. Harris, of Dapto, who, after carefully growing them, reported that they were very valuable, and expressed a wish for an experiment on a larger scale. Perhaps in a better season these varieties will show to better advantage.

At Moss Vale, on Mr. P. Throsby's estate, some splendid hay was taken off some blocks of John Brown and Thew.

The plots at Bombala were put in for grain, and were the last sown. They got better weather conditions than most other plots, and have given very satisfactory results. Marshall's No. 3 came top, with a yield of 32 bushels per

acre. Right from the start this variety led the way, and at time of harvesting was a picture. The ears grew long, the straw was clean, and the grain very fine. It is hoped that the farmers in the district will avail themselves of the seed.

Oats.

At Berry Stud Farm, Amarilla beat Algerian in weight for green feed, but on the other plots it was beaten by Algerian; this was on account of both varieties being cut on the same date, and is hardly a fair comparison, as Amarilla is much earlier than Algerian, and the forage was consequently a bit on the dry side. Amarilla resembles Algerian in growth, being fine in straw, rust-resisting, and weighing well; the main difference being that it is earlier. Seed of it has been saved on several plots.*

Abundance Oats at Bombala.

Carter's Royal Cluster Oats at Bombala.

As far south as Moruya, other varieties, viz., White Tartarian, Carter's Royal Cluster and Abundance, rusted badly, and in most cases were fed off or ploughed under. At Pambula and Bombala these same varieties grew remarkably well, so much so that the crops on the plots were saved for seed. At Pambula, Abundance grew up about 6 feet high, had splendid heads, and showed no rust whatever.

* In the trials in the inland districts it was found that Amarilla so closely resembled Algerian in every respect, excepting that it was a little earlier, that we can only conclude that this is really a strain of Algerian and not a variety.—ED.

Rye.

The rye plots did well, and in some cases where farmers are prejudiced, they are watching for further experiments.

At Unanderra, Black Winter and White rye grew side by side, showing very little difference, and giving good returns. At Kangaroo Valley, Emerald rye gave a return of 14½ tons of green feed, whilst White rye yielded 13 tons 4 cwt. Emerald proved the better stooler, but it does not come quite so quickly. At Moss Vale, Black Winter grew very well on a patch of poor ground. At Bombala, the same variety grew up to a height of 6 feet, and was of very even growth.

For winter feed, it is advisable to have a small block of rye, and as far as our experiments go, Black Winter is the best of the varieties. It makes good feed, providing it is not allowed to get too harsh. If it is cut just as the ear is peeping through the sheath it will be found to be succulent; after that it gets dry and harsh. It is hardy stuff, and will grow best of all crops on poor soils. It responds to manuring.

Barley.

The barleys were disappointing; the only plot that gave a return of any account was the plot of Skinless at Kangaroo Valley. This gave 12¾ tons green feed per acre.

Several varieties of malting barley were tried, but did very poorly, and the same remark applies to Cape. With better seasons, Skinless barley should do well.

Variety Trials.

Variety.	Dapto.	Unanderra.	Berry.	Kangaroo Valley.	Moss Vale, No. 1.	Moruya.	Pambula	Moss Vale, No. 2.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Wheats—								
Thew	2 1 3	2 9 1	2 17 2	8 5 2	6 16 0	....	5 0 0	2 10 1
Huguenot	3 8 2	3 3 3	Failed	Failed.	....	....	4 5 2	....
John Brown	3 15 0	2 15 2	3 17 1	....	....	....	5 14 1	3 9 0
Warren	2 13 2	3 1 1	Failed.	....	6 16 0	....	5 17 0	....
Medeah	....	3 4 1	....	Failed.	....	1 14 1	....	....
Uppercut	....	....	3 15 3	....	....	....	....	....
Bobs	....	....	....	....	7 0 0	....	....	....
Oats—								
Amarilla	2 6 3	5 7 0	5 9 1	Left for grain.	....	....	....	....
Carter's Royal Cluster ..	Failed.	Failed.	Failed.	..	....	....	....	....
Abundance	do	do	do	Failed.	....	....	....	3 2 3
White Tartarian ..	do	....	do	do	....	....	....	4 6 1
Algerian	2 9 1	6 4 1	4 14 1	11 6 0	....	1 16 1	....	....
Great Northern	....	....	....	Failed.	....	....	....	....
Twentieth Century ..	....	....	....	do	....	....	....	....
Barleys—								
Skinless	0 19 1	3 0 0	....	12 17 2	....	....	2 8 2	....
Goldthorpe	....	Failed.	....	....	....	....	....	....
Kinver's Chevalier ..	....	....	....	....	....	....	2 2 3	....
Cape	....	....	....	....	....	....	3 11 1	....
Rye—								
White	2 9 1	5 0 1	..	13 4 0	....	....	....	....
Black Winter	2 6 3	5 11 1	8 11 1	....	....	1 10 0	....	....
Emerald	..	...	9 5 2	14 16 0	....	....	....	....

Manurial Experiment.

A manurial trial was conducted with wheat in four districts on the South Coast, viz., Dapto, Unanderra, Berry, and Pambula. It was arranged that three plots should be shown at each place, one with superphosphate, one with superphosphate and sulphate of potash, and one without manure; but at Unanderra, in consequence of the limited area available, only two were sown, viz., superphosphate and unmanured.

As in other districts, the variety used was that best suited to each district. The results were as follows:—

	Dapto.	Unanderra.	Berry.	Pambula.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.
No manure	1 12 0	2 15 2	1 8 2	3 10 0
Superphosphate	2 1 3	4 15 3	1 11 1	3 8 2
Superphosphate and sulphate of potash	2 6 3	....	2 8 2	6 0 0

This clearly shows that, as in previous years, the manured plots gave far better results than the unmanured, and it will be noted also, that the addition of a small quantity of potash had a decidedly beneficial effect. There can be no doubt that on the South Coast on almost all soils, with the exception of the very rich river flats, not only should all crops be manured, but also that a heavy manuring is required to get the best results.

With winter cereals, superphosphate was the first manure tried, and last season a mixture of superphosphate and potash was also used. During the coming season it is proposed to try a complete manure in comparison with these two.

French Bean Weevil.

A correspondent recently sent to the Department samples of French Bean seeds which he had purchased from a local storekeeper two months previously, and which contained the eggs of the Bean Weevil (*Brucus, sp.*). This is a small beetle that lays its eggs in the baby bean on the plant, the young beetle grubs feeding and developing inside the bean in the pod. They do not show until the beans have been ripened and stored, when dark spots may be noticed on the beans, out of which the young flies emerge.

The Government Entomologist states that it is not advisable to sow beans thus infested, as they are weakened through the damage to the seed, and the beans are reinfested. Soaking the beans in water for twenty-four hours before they are planted will kill the insects in the seed.

This weevil is quite distinct from the French Bean Fly (*Agromyza phaseoli*), which lives in the *stalks* of the beans.

Winter Fodder Crops on the Richmond.

H. R. ALEXANDER, Manager, Wollongbar Experiment Farm.

WHEN and what to sow as fodder crops, which will be available for the feeding of our Richmond River dairy herds towards the middle and end of winter, is a matter of immediate importance to our farmers at this time of the year. According to the number and requirements of the milking herd an area of land should be sown in March, April, and May. When this can be, and is done, a fair and continued supply of green feed may be anticipated.

In this district green oats have been the fodder most universally relied upon, Algerian oats, owing to their rust-resisting qualities, being the favoured variety. During late years, however, Algerian oats, grown locally, have been more or less attacked by rust, in many instances the crop from this cause being rendered practically a failure.

Rye comes next to oats in popularity. Rye in its early stages of growth makes good feed, but if allowed to mature or ripen it is of comparatively poor fodder value on account of beard and the hard, dry, fibrous nature of its straw.

During the season 1910 a comparative trial was made at Wollongbar with several varieties of oats, wheat, rye, and barley to ascertain the respective values of such crops for fodder purposes. The results are given in this issue.

They place two of the wheats in advance of the best Algerian oats, *Medeah* wheat also giving a heavier yield per acre than the best rye crop. So satisfactory and vigorous was the growth of *Medeah, Huguenot,* and *Thew* wheats that they should certainly be given a more extended trial locally during the season 1911. Medeah can be recommended for early planting and green feed. The early-maturing and beardless qualities of Thew strongly recommend this variety of wheat for hay-making purposes in our district; at Wollongbar, Thew wheat was fit to cut as hay by the end of August, or three and a half months after sowing. August and September are usually dry months on this river, and are consequently admirably suited for hay-making work. Further, the harvesting of the hay crop early in the season gives ample time to prepare land for a subsequent summer crop.

To farmers on Richmond River small areas, where seed-drills are unknown, we recommend that the following quantities of seed be broadcasted per acre:—

Oats	2 bushels.
Rye	$1\frac{1}{2}$ „
Wheat	$1\frac{1}{2}$ „

Green wheat, oats, rye, and similar fodders are in themselves good foods, but to the dairyman they lack that all-important food-element, "protein."

A cow to yield milk must have a certain percentage of protein in her ration, and the more milk a cow gives the higher will that percentage of protein need to be. Thus to get the maximum benefit from crops of green oats or wheat, as the case may be, protein in one form or another must be added to the cow's food allowance. Can this be done economically? Bran, when shipping and carting charges are added to its original cost, cannot be considered favourably in this district. Lucerne would supplement the cow's ration admirably, and will pay, provided always it is grown on the farm and not hauled from Sydney. Unfortunately, few men in this fertile Richmond River district grow lucerne, though many local farms have flats eminently suited to its growth. However, we have another means of supplying protein with our winter fodder crops in the form of vetches or field-peas. One or other of these legumes should be sown with oats, wheat, or rye. Both vetches and field-peas grow well at Wollongbar. They add to the total weight of crop per acre, enrich the land, and bring the feeding ratio of the crop nearer the recognised milk-making standard. With the wheat or oats sow vetches, 20 to 25 lb. per acre; field-peas, $\frac{3}{4}$ to 1 bushel per acre. When vetches or field-peas are sown broadcast with the oats or wheat, the quantity of seed per acre of the two latter can be slightly reduced. Sow lucerne this month, on deeply-ploughed land, free from weeds.

Fruit Flies.

Mr. O. Brooks, Fruit Inspector, Gosford, reports that the Queensland Fruit Fly (*Dacus Tryoni*) appeared in the orchards of that district about the middle of August, 1910, and could thereafter be seen on the wing wherever Emperor mandarins were growing. Only when the mandarins were finished was infection found in the oranges, and then it was generally slight. Mr. Brooks considers that the early appearance of the fly was due to the mild winter and early spring, and to the fact that there was none of its natural food (wild plums, &c.) ripe at the time. The fly was not seen in the orchards since the latter part of November, except in one orange orchard. Where there are wild plum and white ash trees growing within a few yards of cultivated fruit trees, although there are ripe fruits on the trees, no infection can be found in the orchard fruit, but the fly may be very prevalent on the wild fruits. This confirms the observation of Mr. W. B. Gurney in May, 1910, *Gazette*, that the Queensland Fruit Fly generally prefers its natural food, the wild fruits, to orchard fruits.

Slight infestations of Island Fruit Fly (in damaged fruit or fruit already punctured by another fly), and Mediterranean Fruit Fly early in the season, were also observed; but flies hatched out by Mr. Brooks from orchards in different parts of the district during the latter part of the season, always proved to be the Queensland species. In most cases growers complied with the regulations very well, and an enormous quantity of larvæ must have been destroyed.

PIGS . . .

—AND THEIR—

. . . MANAGEMENT.

BY

H. W. POTTS,

Principal, Hawkesbury Agricultural College. Richmond, N.S.W.

We have pleasure in informing many correspondents and personal inquirers that this book is now obtainable from the Government Printer, Sydney; price—cloth, 3s. 6d., postage, 7d.

Synopsis of Chapters.—Introduction—The Boar and Sow—Breeds—Cross-breeding—The Feeding of Pigs—Crops for Pigs: Lucerne, Legumes, Rape, Roots and Tubers, Pumpkins, Marrows, Squashes and Melons, Maize, Sorghums and Millets, Cereals—The By-products of the Dairy—Feeding Calendar—Construction of Sties—Slaughtering—Bacon Curing—Diseases of the Pig. An Appendix contains photographs of the high-class imported and other stock purchased from Mr. Herbert Garrett, "Loch Maree," Randwick, and recently added to the College stud piggery.

The chapters on Construction of Sties and Diseases of the Pig have been contributed by Mr. A. Brooks, Works Overseer of the Department, and the Veterinary Officers of the Stock Branch respectively.

The book comprises 182 pages, royal 8vo., and contains 140 illustrations. These include photographs of boars, sows and litters of the various standard breeds from the College stud—high-class and typical animals, showing the points of the different breeds; photographs and plans of sties, troughs, drains, and other necessary structures; illustrations of implements for and correct methods of slaughtering; pictures of growing crops, and so on. The excellent paper upon which the book is printed assists in making the illustrations a special feature.

The book opens with a review of the pig industry and its prospects in this State; but this is only briefly touched upon, and the author comes straight to practical work—the necessity for suitable water supply and shelter; the points of a good boar and sow; mating and parturition; rearing of young pigs. The several breeds—Berkshires, Yorkshires, Tamworths, Large Blacks, Poland-Chinas—are described, with scales of points and photographs. Principles of crossing are explained, and results given of tests made at the College. Several chapters are devoted to feeding and crops, cultural advice

being given in the case of each crop, and a calendar gives dates of planting and feeding. These, of course, will require some modification in particular districts. The chapter on construction of sties, yards, troughs, and drainage will be a revelation to many readers when it is seen how cheaply cleanliness may be combined with efficiency if proper methods are used. The pig is only an unclean animal when man makes him so. Slaughtering and bacon-curing are explained in detail, with illustrations of each stage of the work, recipes for curing, and full particulars of smoking, &c. The diseases section is written in simple language, and will enable lay readers to readily recognise infectious disease and prevent its spread, as well as apply home treatment in simple cases.

To all those who know the great value of pigs on the farm, and are engaged or propose to engage in the industry, either as a side line or as specialists, we can confidently recommend this book.

Irish Blight and the Weather.

In October and November last year, experiments in spraying summer crops of potatoes for Irish Blight (*Phytophthora infestans*) were conducted in the West Maitland district, under the supervision of Mr. W. J. Allen, of this Department, upon land held by the following farmers:—J. Pilgrim, Bolwarra; A. Vollmer, Woodville; M. Hoban, Dunmore; and Joseph Campbell, Phœnix Park. The seed used was selected from blight-infested crops, removed during the winter, and it was planted in the ground upon which it was grown. Sprayed and unsprayed crops were similar throughout the season. There was no Irish Blight in any of them. In the early part of the season dry weather was experienced with occasional cold snaps, but very little rain was recorded. From the middle of the season onward good rains fell, but at no time did there appear an excessive amount of moisture in the soil.

Mr. Gus. Smith, of Failford, had his crop stricken with blight last season, but on the same ground this year he has obtained a beautiful crop, with no sign of disease.

Mr. Fruit-Inspector O. Brooks reports that all the potato crops grown in the Gosford district last spring were practically free from blight, although in many instances the seed was saved from the previous crop, which was badly infected with blight. Some few growers sprayed with Bordeaux mixture, but very little difference was noticeable between sprayed and unsprayed beds.

These reports are published in order to place on record concrete evidence of the fact that this last season our early potato crops have been free from the dreaded scourge. Science and common sense alike tell us that this is the result of the comparatively dry spring, which may be regarded as the normal condition in many districts. Irish Blight requires warm moist weather to develop into a serious disease. The spores, or seeds of the fungus, are scattered throughout large portions of the State; but it will only be in warm moist weather, such as that recently experienced, that it will cause any serious damage.

Department of Agriculture.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

WINTER SCHOOL FOR FARMERS, 1911.

SHORT COURSES.

THESE are provided at the slack period of the year for busy farmers and stock-owners who can devote only a limited time to study and intensive practical instruction. They are thus afforded the opportunity to acquire the greatest amount of directly useful information in the shortest time.

The Winter School Course embraces a variety of subjects, of which it is impossible for one student to take up the whole; but the applicant for admission is requested to state the Courses of Lectures he desires to attend, and the special training he seeks on the farm and other departments. Copies of the Syllabus are obtainable from the Under Secretary, Department of Agriculture.

The Course of Instruction is continued for four weeks, commencing on Monday, 19th June, 1911, and terminating on Saturday, 15th July, 1911.

Farmers and graziers, or their sons who have worked at least one year on the land, and being over 16 years of age, are eligible for admission; the number, however, being limited to 100. Ex-students of the College are not eligible for admission.

Application for entrance must be forwarded to the Under Secretary, Department of Agriculture, Sydney, not later than 31st May.

Railway Passes are made available at single rates for the double journey to all students attending the Winter School, and are of five weeks' duration. The pass is obtainable on presenting a certificate signed by the Under Secretary of Agriculture, stating that the holder is a student proceeding to the Hawkesbury Agricultural College, Richmond, to attend the Winter School.

A fee of £2 2s. is charged for the Course, including board and lodging, &c., at the College. The fee is payable in advance to the Under Secretary of the Department.

All students are to be subject to the Regulations in force at the College.

Each student must provide himself with towels, sheets, pillow-cases, soap, and blacking-brushes.

A programme of all lectures and outdoor work will be placed on the College notice-board.

Students are expected to select such branches of training as may be best suited to the conditions of their own districts and farms.

The College Reference and Circulating Library and the Reading-rooms are made available for students.

The Gymnasium and Recreation Grounds are well equipped, and can be used by students.

Insectivorous Birds of New South Wales

[Continued from page 207.]

15. Grey Shrike Thrush.

IMMIGRANTS to these States, whose memories naturally turn back to the land of their youth, and who sometimes long for the voices of animate nature which delighted them at home, have introduced a number of British song-birds into Australia. The Skylark, the Blackbird, and the Song Thrush are amongst the British birds which may be heard warbling under our sunny skies. So delighted are our immigrant friends with the success of these importations that they still sometimes utter the oft-repeated slander that "Australian birds have no song."

We have already in this little series had several opportunities of refuting the charge: and we now give a plate of the Grey Shrike Thrush—the native Australian bird upon which John Gould, the English bird-lover of all fame, bestowed the specific name of *harmonica*, or "musical," in allusion to its rich, sweet, clear, ringing notes.

The "Whistling Dick," as he is sometimes called, possesses quite a repertoire of songs, and he is generally willing to go through them all, if encouraged to do so. In the early spring mornings he commences with the simple call sounding like the words "my *chop*," and if imitated by the listener he will proceed to a more complicated variation, and so on until he produces a compound *glissando*—half whistle, half screech—that is quite inimitable. When satisfied that he has beaten his human imitator, he will return to the more simple, but richly beautiful notes.

This Thrush is distributed throughout Queensland, New South Wales, Victoria, and South Australia. In the wooded, well-watered gullies, or on the margins of rivers and creeks, it may be met with throughout the year, but it also resorts to open forest lands and particularly to partial clearings and the neighbourhood of orchards. It is 9½ inches in length, heavy-footed and somewhat clumsy, so that its movements in the timber are clearly audible. The business upon which it is engaged may be gathered from the following remarks of Mr. Hall:—

> I once heard a naturalist say he hunted high and low for small worms and insects in a certain gully, but without success, thanks to the Thrush, who is the self-constituted police bird of these same gullies, keeping in subjection the snails and other vermin that quickly disturb the balance of nature if allowed unchecked sway. The watchfulness of the bird applies as well to hundreds of hillsides upon which fruit-trees have of recent years been planted. It has a varied taste, and any creeping thing does not come amiss. It tugs away at a cluster of woven leaves till the hidden spider's nest or that of certain caterpillars is dissected, or carefully pries into any suspicious-looking corner that is likely to harbour a good-sized beetle. Among many curious forms I drew from a Thrush's gizzard a young lizard in good order, and in length 2 inches, which had evidently just been swallowed.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"GREY SHRIKE THRUSH."

Collyriocincla harmonica, Latham.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"DOLLAR BIRD."

Eurystomus australis, Swainson.

As we are busy with these notes, the messenger brings in a report written by Mr. P. Quirk, Manager of the State Stud Farm at Berry, on the South Coast, to the effect that a plague of caterpillars have destroyed all the fine growth of grass and fodders which resulted from the late heavy rains. The caterpillars followed the flood level, and did not touch the hills; but Mr. Quirk says they ate everything in the shape of grass or fodder from Berry to Nowra, and he quotes a remark of a local farmer, made in that vein of sarcastic humour with which the true Australian meets all reverses, that the caterpillars were not so bad after all, as they left the barbed-wire fences.

It is easy to moralise. Where were the feathered friends who would have revelled in the feast provided by the soft bodies of the pests? Where were the Shrike Thrushes whose loud pæans of joy should have echoed through the southern hills? Truly the catapult and the pea-rifle have much to answer for.

The Shrike Thrush builds a bowl-shaped nest of bark and fibrous roots, usually low down in a gum or tea-tree; generally, as in the illustration, in a hollow tree-spout. It usually lays three eggs, and rears two broods per annum. These birds have a habit of returning for at least five consecutive seasons to the same spot to build.

The Shrike Thrush is tame and fearless, and easily found in the bush. Our sporting instincts might be exercised upon something less homely and less useful.

16. Dollar Bird, or Australian Roller.

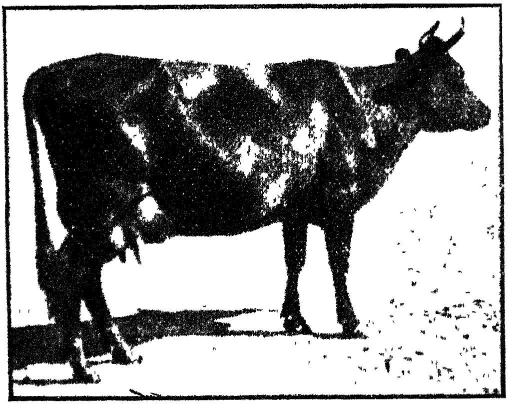
This is a migratory bird, most frequently seen in New South Wales during the breeding season, October to March, chiefly on the North Coast, but often about the open forest country east and west of the Blue Mountains. It is a powerful destroyer of insects, and should be allowed to breed at will. The mouth is yellow inside, and the bill is as broad as it is long, with the culmen rounded. These characteristics are somewhat exaggerated in Gould's plate, of which our illustration is a photograph in colours.

The bird is $10\frac{1}{2}$ inches in length. It is called "Dollar" bird from the conspicuous white spot seen in the centre of the wing when it is flying; and "Roller" from its tumbling habit of flight. It does not build a nest, but lays its eggs in a hole in a tree, sometimes in the nest of the Laughing Jackass, which it may dispossess after a fight. It usually lays four pearly-white eggs, and will fight any intruder who attempts to interfere with them. It is a pugnacious, noisy bird, and its cry is anything but musical.

The food of the dollar birds consists of beetles and other large insects. They perch on the topmost branches of dead trees, from which they take short flights to capture flying insects. They are particularly fond of the large leaf-eating phasmas, which they thump against a limb before swallowing. They are not usually gregarious, but are sometimes seen hawking for insects in groups. They will return to the same locality each year, and must be of great assistance in keeping down the larger forms of insect life which our fertile northern districts produce.

Remarkable Success of the Kerry Cross.

At the Hawkesbury Agricultural College there are some very fine producers, some of which are by a Kerry bull from grade Jersey cows; and some of the daughters of these by a Jersey bull have given remarkable records, considering the class of country on which they are depastured, even though hand feeding is added.



No. 56.—Jersey-Kerry-Jersey.

A photograph of cow No. 56 is given. Her yield last year was 9,364 lb. of milk, which produced 462 lb. of butter.

Other cows' records are as follow:—

No. 27—8,166 lb. milk,	producing	393 lb.	butter.
,, 42—7,896 ,,	,,	378 ,,	,,
,, 31—7,569 ,,	,,	361 ,,	,,
,, 10—7,270 ,,	,,	322 ,,	,,
,, 75—6,545 ,,	,,	307 ,,	,,

All these are either half-bred Kerries, or are by a Jersey bull from half-bred Kerry cows. The Kerry bull illustrated is one of the best of his breed in the world. He was bred on the State Stud Farm at Berry.

The Principal of the College is justly proud of his Kerry cattle.

Kerry Bull.—Kildare II.

American Maize Smut.

T. HARVEY JOHNSTON, M.A., B.Sc., Bureau of Microbiology, Sydney.

IN January, 1910, there appeared in this *Gazette* a note dealing with maize smut. At the time the disease was regarded as being due to the fungus *Ustilago maydis* (= *Ustilago zeæ*), which is the parasite usually met with on maize. However, as Mr. McAlpine pointed out a little later in his "Smuts of Australia," the fungus in question was not *U. zeæ* but a closely related form, *U. reiliana* (= *Sorosporium reilianum*). The latter generally attacks sorghum, its occurrence on maize in other parts of the world being rather uncommon. It often receives the name of "Head Smut," on account of the fact that its presence is usually made manifest by the appearance of smut boils in the inflorescence of the attacked plant. The various records of *U. maydis* should be referred to *U. reiliana*, as Mr. McAlpine has pointed out. He, moreover, emphasises the fact that the American maize smut has not so far been found in Australia.

Some little time ago Mr. G. H. Johnston, of the Bathurst Experiment Farm, forwarded to the Bureau of Microbiology a small smut boil, stating that the spores seemed to him to be somewhat different from those of *U. reiliana*, and that, since the variety infected, viz., "Funk's Yellow Dent" was an American one, the smut might be the American smut. An examination of the spores showed the fungus to be *U. zeæ*. On visiting the plot a few infected plants were seen. In one case two large smut boils were present on the stem just at ground level (Fig. 1). In specimens sent down a few days later (Fig. 2) the boils were seen on the "heads" and tassels and on the stem and leaf bases. In the cases where the heads were affected the condition at first sight resembled the ordinary "head smut," though there was much greater swelling and destruction than in the case of the latter.

The spores of the American corn smut are able to infect any young portion of the plant, whether it be the stem, the leaf (especially the leaf-base), or the head, producing "galls" or "boils," which vary in size. These galls are covered with a whitish membrane, through which the dark spore-mass may be seen. On maturity, the membrane bursts and the spores are liberated. It is thus a case of local infection instead of seedling infection, as occurs in most of the smuts. In the latter case steeping the seed is the main preventive; but in the case of the smut in question, the destruction of the smut boil or smut gall is the method to be adopted in coping with this pest, as by this means the spores do not have an opportunity to infect other plants or other parts of the same plant. Moisture is necessary for infection, and hence damp weather is more favourable for the spread of the disease. Stevens and Hall state that the only practical way of dealing with this smut is to go through

the maize field at regular short intervals and cut out, collect, and destroy the galls before they have a chance to liberate their spores. It is unwise to feed the diseased plants to stock, as many of the spores pass through the animal uninjured, and are able to develop to a certain degree in the manure, which may thus become a fresh centre of infection.

WINEMAKING ON A SMALL SCALE.

AN orchardist asked for advice how to make a small quantity of wine, say about 30 gallons, from Black Hamburgh grapes. The following report was written by Mr. M. Blunno, Viticultural Expert of the Department:—

To make 30 gallons of wine, 4 cwt. of grapes will be required. Crush these, so as to break the berries and let out the pulp. Put juice, skins, seeds, and stalks in a vessel holding about 45 gallons. This vessel should be a vat, not a cask. At a pinch a tub will do. Put a lid or a cloth on the head of the vessel, and keep it in a cool place.

After the first twenty-four hours, the skins and stalks will gather on the surface. Push them down with a rammer. After twelve hours they will come up again. Push them down once more, and repeat this twice a day for about five days. By that time the grape juice has become wine.

Separate the liquid from the husks by drawing it from a hole at the bottom of the vat. Put the husks and stalks in a press—say a small fruit-press—and squeeze out more wine, adding it to that drawn from the vat. Put the wine in a 26-gallon cask, filling it to about 4 inches from the bung. Place a small sand-bag on the bung.

After a fortnight's rest, rack the wine off from this cask and put it into another cask, which is filled right up to the bung. A portion of the wine, say 4 gallons out of the 30, is put into jars and bottles, and at first every week, then every fortnight, the ullage is filled.

With the first snap of cold weather, rack the wine off again, and repeat this about the end of September.

It is needless to say that all vessels and utensils should be scrupulously clean. All wooden vessels should first be washed with water in which ½ lb. of washing soda is dissolved in every gallon of water. The inside surface of the vessel should be wetted with this water several times. When drained, another treatment follows with water in which a wine-glass of sulphuric acid is added to each gallon of water. Treat the inside surface of the vessels with this solution, as was done with the soda and water, and then rinse several times with fresh water. The vessels may then be used.

DRY FARMING AT COLLARENEBRI.

MR. W. H. CLARK, of Gomalally Station, 12 miles west of Collarenebri, in the north-west, has been growing wheat for hay for the last twenty years, and has had payable returns sixteen times out of eighteen sowings. In two seasons the ground was too hard to plough. Last season he had a light crop of Federation, but, of course, this variety is not suitable for hay.

The Department is supplying Mr. Clark with samples of seed of different varieties for trial.

"TURKEYS: IN HEALTH AND DISEASE."

FARMERS' BULLETIN No. 40, dealing with this subject, is now available. It is a collection of articles which appeared in the *Gazette* last year. Copies may be obtained free by farmers interested upon application to the Under Secretary, Department of Agriculture, Sydney.

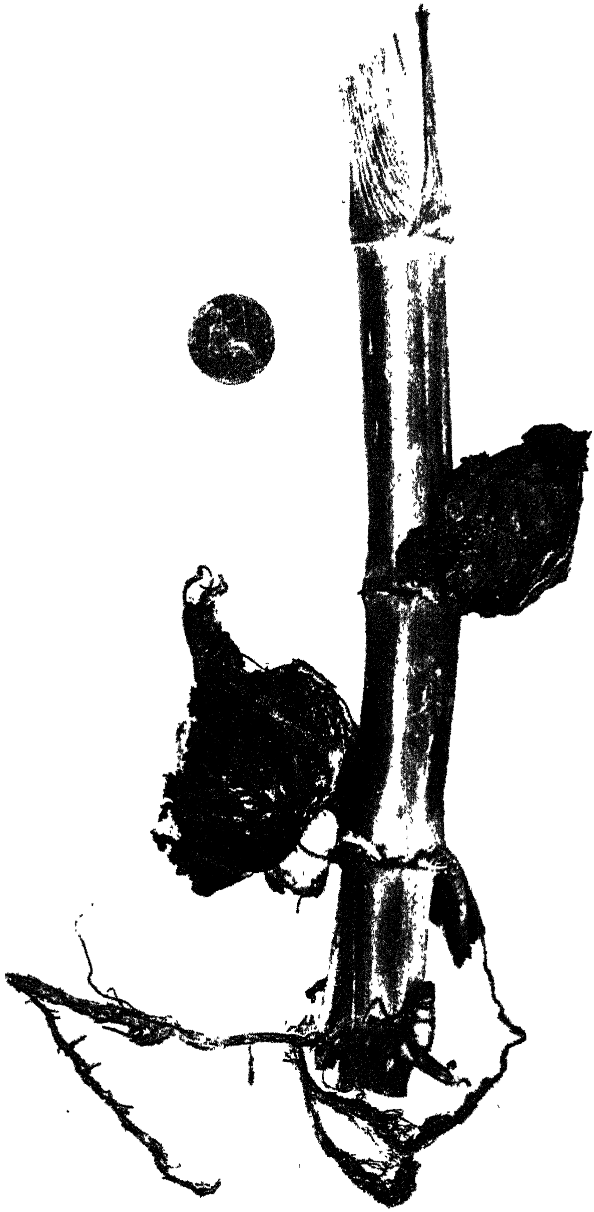


Fig. 1.—American Maiz Smut. Base of Stem of Maize plant showing "Smut galls."

Fig. 2.—American Maize Smut. "Head" and stems showing presence of "Smut galls" (*Ustilago zeæ*).

The Prickly Pears of Interest to Australians.*

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

No. I.

As the spread of prickly pear in this State has cost the Government such large sums, for inspection, &c., as may be fitly described as enormous, for eradication alone, to say nothing of the direct loss of the use of land (frequently good land), which is useless because of uneradicated prickly pear; and, furthermore, inasmuch as under the provisions of the Prickly Pear Act a citizen failing to comply with the regulations is liable to a fine of £20 or, in default of payment, to imprisonment (I presume), I think it will be conceded that the prickly-pear question is an important one.

We are not alone in our prickly-pear troubles by any means. Some years ago the Department of Agriculture of the United States published a statement that hundreds of square miles of the richest grazing country in Southern Texas have been overrun with prickly pear, and the growth is each year becoming more impenetrable. In many of the southern counties it has been estimated that this plant has already decreased the carrying capacity of the ranches ("stations" we would call them) one-fourth to one-third. The prickly pear is indeed a curse to the stock country. Some years ago, before cotton-seed hulls and meal were available as fattening food, the pear was quite largely used, after the spines had been disposed of, by roasting or boiling. Now the cheaper and better cotton-seed hulls, which do not require a like amount of labour in their preparation, have almost entirely displaced it as a fodder.

The Department further stated that, as a result of this rapid increase of prickly pear, the grass is being eaten to the roots wherever stock can get it between clumps of the pest. Paths are worn and the ground is trampled, and the only grasses that are allowed to ripen seed are those growing within these thorny citadels of prickly pear. Cattle on the range will not eat prickly pear unless driven to it by hunger and thirst. The report concludes with these words :—

> It is a better substitute for water than for food, but with this statement of facts the best has been said concerning the forage possibilities of this plant.

Since the above was written, many valuable experiments on prickly pear have been conducted under the auspices of the United States Department of Agriculture, with a view to check its inroads, and to harness it for the service of man. The results of such experiments I will give later.

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* See my previous article entitled "A preliminary study of the Prickly Pears naturalised in New South Wales" (illustrated); *Agricultural Gazette of N.S.W.*, September, 1898.—J. H. M.

A Select Committee appointed by the Legislative Council of Cape Colony, in reference to the prickly pear, reported that the plant had spread to an alarming extent, that it specially fastens on good land, and is at present destroying portions of the best and most fertile land, public and private, that the colony possesses. "We have it in evidence that the depreciation of the property in certain districts has already reached 50 per cent., while all farms contiguous suffer in proportion. That depreciation is going on so rapidly that immediate remedial measures are necessary."

Governor Phillip introduced the prickly pear into Australia, he having brought it from Rio de Janeiro with the First Fleet in order to establish the cochineal industry. Since then people have introduced many different species, and many years ago some used to claim the honour of its introduction as a useful plant, but their descendants are silent on this point now.

I do not know when prickly pear first came to be realised as a pest amongst us. Certainly not in the thirties, for Mr. James Busby, who may be fairly hailed as the father of the wine-industry in New South Wales, and who was a judicious introducer of plants, in his work of the Culture of the Vine in New South Wales, published in 1832, speaks very zealously of the desirability of introducing the prickly-pear hedges of Spain into New South Wales.

The prickly pear belongs to the Cactus family, or as botanists now put it, the family *Cactaceæ*. This family contains about fifteen genera (botanists have not quite decided as to details), of which *Opuntia* includes the prickly pear. *Opuntia* consists of about 200 species, many indigenous to the tropical or sub-tropical parts of America, though some are natives of colder regions. Some of them attain a height of 20 feet and are broad in proportion; others are only a few inches high.

The word "cactus" is now simply a vernacular, and not a botanical name.

Opuntias flourish very well in certain parts of New South Wales, and up to the present time at least ten species are known to have escaped from cultivation in Australia. It is proposed in this series of articles to figure these plants. One in particular is so much at home in New South Wales and Queensland, that it has rendered vast areas of land useless, and I propose to call it the "pest" pear. Some others have made infinitely less growth, but they should be destroyed; a few are quite harmless, and one or two may be enrolled in the category of useful plants.

In Australia alone quite a literature concerning prickly pears is growing up, but much of it is not very helpful, and most of it is not original, often having been copied from previous writers, with fanciful improvements; for prickly pear is quite a tempting subject to write upon.

The subject is a many-sided one, and in the course of these articles I shall specifically refer to *Uses* :—

(*a*) Fodder value.
(*b*) The fruit as human food.
(*c*) Source of sugar and alcohol.
(*d*) Source of fibre.
(*e*) Plant as a preventer of land erosion, and as a soil arrester on barren spots.

Then we shall consider some of the methods propounded for its destruction, grouped under mechanical means and chemical agencies respectively. Insect and fungus pests have also been contemplated as pear destroyers, and will be briefly referred to.

But the very basis of all knowledge of plants is accurate information as to the identity of them. It is very little use talking about prickly pear unless we know the kind of prickly pear we are discussing, for they are most variable.

The subject is of grave importance to us as a State, and even of greater importance to Queensland. We have been somewhat easy-going in regard to it, and I think that careful pronouncements on the subject, from both the scientific and utilitarian aspects, may tend to more definiteness in waging the war against it, and in utilising it so far as it can be profitably utilised.

General Description.

Opuntias, or prickly pears, are green, more or less succulent or fleshy plants. The stems are green also, at least when young. The character of the succulence which prickly pear has, in common with other desert plants (botanists call them "xerophytes," from the Greek *xeros* dry, and *phyton* a plant), has been attained by long adaptation to their environment. The tissues of such plants are mainly composed of cells which have large storage capacity for water, and the water once absorbed by the plant remains with it during the lengthened periods in which no rain falls. The marvellous arrangement by which the dissipation of this moisture by the ordinary process of transpiration which obtains in leaves is avoided, is somewhat complicated, and is not easy to explain without resort to technical language. It may, however, be stated that the cell-wall of the tissues of the prickly-pear plant is peculiarly formed, and the watery contents of the cells which fill the vesicles contain slimy organic substances dissolved therein, whose function is, in part, to hinder the evaporation of water. The green plants flourishing amidst a general aridity are a wonderful sight, and cause people to think that they flourish because of the drought instead of in spite of it.

These juicy, flat, green stems not only act as water stores, but perform assimilatory functions in place of leaves. The leaf-shaped fleshy portions are termed "joints."

Most plants are classified according to their flowers and fruits (their reproductive organs), but in Opuntias they are better classified according to their vegetative or non-reproductive organs.

If you dig up a prickly pear, particularly that species which has committed such devastation in New South Wales and Queensland, there is a swelling just under the ground which goes under the name of "bulb" amongst country people. It is not a true bulb; it is a storage organ for water and reserve material, so that if you were to destroy all the visible part of a plant, the existence of the plant could be secured by means of the "bulb." These organs are supremely important, yet I scarcely find any allusion to

them in Cactus literature. Thus Schumann* writes in the general description of *Cacteæ* :—

Bulb-like swellings of the roots, used as storage for water, are found in some species of *Opuntia*, *Cereus*, and *Echinocactus*. In some of the small species of *Echinocactus* the plant dies off entirely above ground in exceptionally dry seasons, leaving a hole in the ground which is filled with dust, thus effectually protecting the stored water in the bulbous root.

In the description of *Opuntia*, Schumann does not mention the bulb-like swelling of the roots at all, and in the description of the species he refers to it only in two cases, viz. :—

Opuntia bulbispina, Engl. The plant has spindle-shaped, fleshy roots.

Opuntia filipendula, Engl. Roots swollen.

Leaves.—The leaves are not the joints (in America the word "slab" has been recently coined for them) already referred to, they are small, round, bluntly-pointed, fleshy, non-fibrous, deciduous organs, which are more or less distributed over the joints. In some species and varieties they are abundant; in others they are but little seen.

Spines.—These are needle-shaped, and sometimes very powerful. They vary a good deal in colour, and Schumann attaches a good deal of importance to this. Having cultivated Opuntias for many years in the open air under conditions very favourable to them, I find that the spines are more variable in the same species than Schumann believed.

They are all very rigid, and in some species will readily penetrate the leather upper of a boot. In some species they are arranged singly, in others in twos or more, and even in rosettes. In some species they are absent. Formidable as they are, they are not so feared by man and stock as—

Glochidia.—These are barbed bristles, often golden-yellow, and quite short. They are arranged in tufts, and in the case of a few species (*e.g.*, *microdasys*) cover the entire plant. These barbs remind one of a South Sea Island spear, and they are characteristic of the genus *Opuntia*. Being so small and light and so sharply pointed, they fix themselves to the skin, or work themselves through clothing with marvellous rapidity and tenacity, and cause serious irritation to man and beast. If the blood be in an unhealthy condition, very serious irritation and even illness may result from these aggravating little bristles.

Areole or *Areola.*—These are small areas, often depressed, scattered regularly over the prickly-pear plant, usually at the base of a true leaf or fallen leaf. In the areole there often spring one or more spines, and the cavity is filled up with glochids and woolly hairs. At the base of the areole is a growing point, from which a flower bud or new point may spring.

Flowers.—The colour of the flowers is usually yellow of varying tints; sometimes it is so pale as to be almost white; or it may be of the deepest orange. In a few cases it may be scarlet or orange-scarlet, and, in a few, pink or carmine. But, speaking generally, the gamut of colour in Opuntia flowers is not great.

* "Gesamtbeschreibung der Kakteen." (1899.)

Fruit.—The fruit is sometimes pear-shaped, hence the name "prickly pear," but very frequently it is spheroidal or barrel-shaped. The external colour is usually carmine, but there are various shades of purple, while we have orange-coloured, cream-coloured, and fruit of other tints. The flesh is usually carmine, but sometimes it is pale coloured, almost white, or slightly green. and sometimes orange The external and internal colours vary with the degree of ripeness, and the colours which I shall give in describing the various fruits will be those noted in the Sydney district.

Botanists preserve plants for permanent reference by drying them in the proper manner. The way in which ladies press ferns is a familiar example. In the case of Opuntias, which are very fleshy, it is obvious that they do not dry readily, and hence a dried specimen gives but a poor idea of the living plant. Added to this, it requires a vast amount of trouble to dry an Opuntia. The result has been that very few Opuntia types have been preserved, and thus it is often very difficult to state precisely the plant meant by the earlier botanists.

The coloured figures have been prepared by Miss Margaret Flockton with great care from living specimens, and it is expected that my readers will have no difficulty in recognising the specific plant referred to if it occurs in their neighbourhood. Publication of these figures will doubtless be the means of bringing unrecorded species to light.

This succulent, overwhelming vegetation is non-Australian; for although we have some native plants that are succulent, they are not remarkable as to number or size. Our succulents are chiefly to be found near the seashore or are desert plants, but none of them approach the size and the aggressiveness of the prickly pear.

The principal indictments against prickly pear are:—

1. It frequently occupies good soil.
2. The profusion of spines or glochidia of some species prevents cattle browsing on it, or man dealing with it, the plants thus becoming a harbour for vermin.
3. The abundance of seeds produced, which, being eaten by birds and animals, are disseminated by their agency. I have heard it stated that imperfectly ripe fruits are a far more certain source of reproduction than perfectly ripe ones.
4. The persistent vitality of the plant. When joints are broken off they readily take root in most parts of the State during the greater part of the year. Besides its spread by seed, prickly pear spreads "vegetatively," this being the technical expression for spread by pieces of the root and stem. Unfortunately it is a very brittle plant, and hence pieces are readily broken off by stock, &c., and being washed away by rain, or becoming entangled in the tails and hides of animals, form new colonies.

OPUNTIA AURANTIACA, GILLIES.

As an instance of the necessity for botanical investigation in regard to the Opuntias wild in New South Wales, I would point out that four species are specifically legislated against, viz. :—

(1.) *Opuntia vulgaris.*
(2.) *Opuntia brasiliensis.*
(3.) *Opuntia monacantha.*
(4.) *Opuntia tuna.*

I have never seen *O. vulgaris* in Australia, except a poor plant in a Botanic Garden. I have only seen one plant of *O. brasiliensis* in Australia, and that is in a Botanic Garden. *O. monacantha* is not rare, while *O. tuna* is a botanical will o' the wisp. No one can run it to earth. One of the species masquerading under that name in Australia is *O. nigricans.*

Now let us consider the prickly pears of Australia in detail.

1. Opuntia aurantiaca, Gillies.

Following is a translation of Schumann's description of the species :—

Shrubby, much-branched, prostrate, dark green, with elongated-linear joints, with 4 to 6 brown spines ; flowers, orange coloured [yellow in our plants.—J.H.M.] ; berries, red.

Shrubby, much-branched, prostrate. Joints, linear-lanceolate to lanceolate, 5 to 20 cm. long, 1 to 2·5 cm. broad ; elliptical in cross-section, very fleshy, dark green, nearly black. Areolæ, circular, 2 to 3 mm. in diameter, clothed with a cushion of grey-white wool-felt. Glochidia hid in the wool-felt, light yellow. Prickles, 4 to 6, spreading, straight, awl shaped, stiff, brown to amber-yellow, the longest over 2 cm. long.

Length of the whole flower 4 cm. Ovarium, pear-shaped to cylindrical, provided with areolæ ; out of whose white felt, short prickles protrude. Perianth, 4 cm. in diameter. Outer perianth-leaves trigonous, fleshy, green, outside shaded with orange-red [what may in common language be called the "outside petals" are suffused with crimson rather than orange-red.—J.H.M.] ; inner ones obovate, blunt, the upper margins incurved ; outside often orange-red ; inside dark chrome-yellow. Stamens, half as long as the perianth. Filaments, white. Anthers, chrome-yellow. Style, as long as the stamens, with 7 incurved yellow stigmas. Berry, carmine-red. Seeds, woolly-hairy.

Native of Mendoza, on the east side of the Cordillera in the Argentine Republic. Introduced to cultivation in 1824 by Nugent, later by Dr. Gillies.

The brief description in Nicholson's *Dictionary of Gardening*, Vol. II, p. 502, is as follows :—

Flowers, orange-yellow. Joints, linear or linear-lanceolate, divaricate, compressed at apex, terete at base, marked with dark green [often brownish.—J.H.M.] spots around the areolæ. Areolæ, large, convex, white-tomentose. Spines unequal, the three longer ones rigid, brown, divergent, the two or three shorter ones white. Height, 3 feet. Chili, 1824. *Bot. Reg.* 1606.

It is figured as so stated, but the figure is not a good one.

Then in Bailey's *Cyclopedia of American Horticulture*, page 1146, we have another brief description, and in the case of such difficult and often confused plants as Opuntias, it is as well to have the independent (or presumably independent) description of various authorities. It will be noticed that Bailey calls the flower yellow :—

A numerously-branched, rather weak, semi-prostrate plant, 3 to 5 feet high. Joints linear-lanceolate to lanceolate, 2 to 10 inches long, ½ to 1 inch wide, elliptical in transverse section, dark green, turgid. Areolæ with a tuft of greyish-white wool and bright yellow bristles. Spines 4 to 6, spreading, straight, stiff, brown to yellow, the longest less than 1 inch in length. Flowers yellow, 1½ to 2 inches wide. Fruit carmine-red, globose, with short spines. Seed with woolly hairs. Argentine Republic.

The word "*aurantiaca*" means orange-coloured, and refers to the flowers. The colour of the flowers of our species is not orange, although the description of the plant agrees in other respects. Indeed, it is usually lemon-yellow, with crimson stains at the backs of some of the petals (perianth leaves). I therefore sent illustrations of our plant to two of the leading Opuntia specialists. Dr. David Griffiths, of the Department of Agriculture, Washington, United States of America, wrote:—

This satisfies my conception of *O. aurantiaca* very well indeed. In our plantations, however, I have never been able to bring it to flower and fruit.

Herr Alwin Berger, of La Mortola, Ventimiglia, Italy, says:—

This is certainly *O. aurantiaca*, Gill.

There has been a good deal of confusion as to the name of this species. In Australia it has masqueraded under the names of *Opuntia ferox*, *Opuntia horrida*, *Opuntia dejecta*, and perhaps others.

Towards the end of the year 1906 I first received this plant from Mr. A. Tuckerman, of Windsor, who wrote:—

I am convinced it is one of the worst kinds. It is a runner, very brittle to handle, with spikes (countless); leaves are about 4 or 5 inches in length, half round; nothing can get near it, being so brittle, and the piece will take hold of anything that touches it. I do not think it bears fruit or flowers.

I leave Mr. Tuckerman's last sentence in, because it is a view generally accepted by country people that some prickly pears do not flower or fruit. This is an error, although some flower rarely in a particular locality. The particular species now under consideration flowers and fruits freely in the Sydney and Windsor districts, and, indeed, wherever I have seen it.

Not long afterwards I received the same pear from Mr. Robert W. Farlow, of Agnes Banks, also in the Hawkesbury district, and following are some of his remarks:—

Collected during a ramble through the bush. Only came across two patches, but reasonably believe there are more growing on soil of clay and ironstone gravel, also on raw sand. Little affected by the protracted drought. From observations I brand it as an infinitely worse pest than the ordinary large-leaved variety. The thorns appear to be magnetic, if such a term be permissible. As soon as they touch an object they fasten securely. I trod on a piece with my boot, and the spines readily entered the hard sole leather. When I lifted my boot I had dozens of the spines which had pulled out of the leaves. I tried it another way. I kicked a piece of the plant with the toe of my boot gently, with the result that they entered the leather of the upper quite easily, and gave me some trouble for my experiment, but I did not mind that. I tried the same experiments on the common large-leaved variety, but could not get the spines to enter the leather in the same fashion. I find it clings readily to clothes, pieces of newspaper, &c. How easily then could it be spread! Undoubtedly it is, and will yet prove a troublesome pest. I can imagine it being readily spread by stock carrying it in their tails; heavy winds sweep paper over bunches, and small pieces cling "cat's-claw" like to fresh fields.

This species has been known for many years in south-west Queensland—for example, in Nindy Gully, near Goondiwindi, where it has obtained a great hold. It is also not rare in New South Wales near the Queensland border, evidently spread from the same focus.

For a long time I only knew two localities, viz., the Hawkesbury district and the Queensland–New South Wales border, but last year I found it in an intermediate locality, *i.e.*, on the left-hand side of the road near Parkville,

travelling from Scone. I only saw one plant there, but there may be others; and it being, in my opinion, one of the worst of all pears, it should be exterminated from any new locality.

There is an interesting article entitled, "Vegetal Dissemination in the genus Opuntia," by J. W. Toumey, then of the Experiment Station at Tucson, Arizona, U.S.A., which was published in the *Botanical Gazette*, Chicago, of August, 1895. He states that "of the fourteen species of *Cylindropuntia* which I have examined in the field, all are more or less adapted for dissemination in this manner,"—that is, detached pieces of the plant being carried by passing animals. *Opuntia aurantiaca* is not one of the Cylindropuntias; but I do not know of any prickly pear which is more readily carried about by stock and human beings in this way.

The pest has a good hold in the Windsor district. In the Roman Catholic cemetery there is a very large quantity, and also in the Church of England churchyard. On the common, west of the railway station, there are several large patches, and I have been informed that it occurs in several other places in the district. I am perfectly certain that landowners do not realise what a very bad pear this particular species is.

Where prickly pear has taken possession of areas, special consideration is necessary, but I have no hesitation in saying that where the first plant of this pest is seen in a paddock or by the roadside, it should be carefully killed. Digging it up and letting it lie is worse than useless. I will, as I have already indicated, deal with the question of extermination in a subsequent article, and meantime urge upon all persons with the control of land not to omit taking steps to keep a paddock clean because there may be only a little bit of pear in it.

Drying Persimmons.

Messrs. Ray Bros., of Epping, have submitted to the Department, through Mr. Fruit-Inspector L. Nicholson, a sample of dried persimmons of excellent quality. As this fruit does so well on our light coastal soils, readers may be interested in a description of the method of drying adopted by Messrs. Ray, at the suggestion of Mr. M. F. Vollmer:—

> The fruit was taken from the trees while still quite firm, with portion of strig attached. It was then peeled, leaving the strig and a small surrounding piece of peel intact. It was suspended by string attached to strigs, and placed in the sun until dried so that no moisture would exude upon pressure between the fingers. The fruit was then placed upon trays and dusted very lightly with castor sugar and placed in the sun. The next day it was turned and dusted with sugar on the other side. The drying process was then continued for a time, but *not* until it became hard and leathery. It was then packed in shallow boxes, and has kept splendidly.
>
> It is necessary that each fruit hang quite free whilst drying, for if placed upon trays in the first instance that part which comes into contact with the tray remains moist.

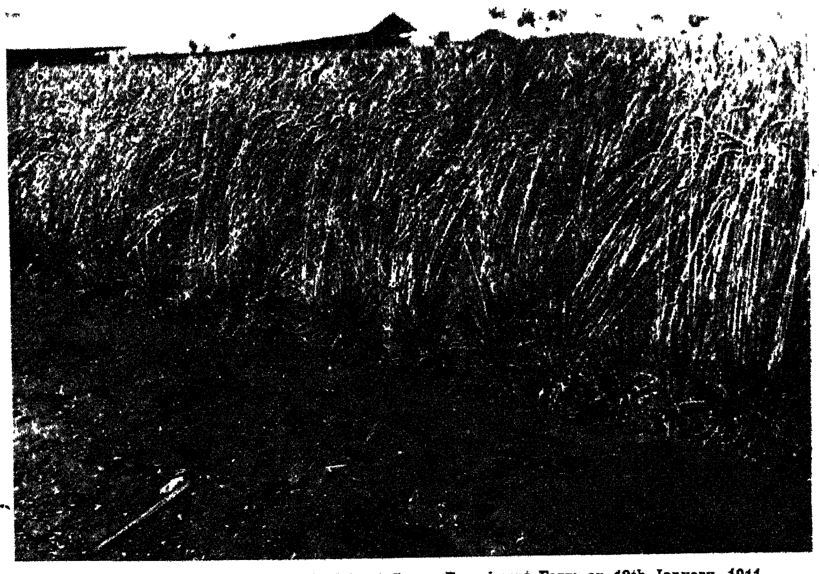
Judging by the sample submitted, Mr. W. J. Allen, Fruit Expert, considers that the persimmon when dried in this way is very much better than either figs or dates, and should command a high price in the market.

Seasonable Notes.

GEO. L. SUTTON, Wheat Experimentalist.

Galland's Hybrid.

SOME little consideration has recently been given, especially in the Gilgandra district, to the question of introducing into general cultivation a variety of wheat called Galland's Hybrid. It is extremely inadvisable that this should be done.



Photograph of some of the wheat plots at Cowra Experiment Farm on 19th January, 1911. "Galland's Hybrid" is seen in the foreground.

Though in some districts it may have a special use, *e.g.*, for grazing or the production of poultry feed, it is not suitable for general cultivation in our wheat districts. Its great drawbacks from a farmer's standpoint are that it is not a good drought-resister, and it is very late. How late this variety is may be judged from the accompanying illustration, which is from a photograph taken at Cowra on 19th January of the present year. It will be seen that on that date the seed stalks were only starting to run up. It is true that it

had not been planted until very late in the season, viz., on 19th August, but other varieties planted at the same time were dead ripe, as may be seen from the photograph. They had been so for some time.

This variety is bearded, but its beards are shed at maturity. It belongs to the Poulard group of wheats, and in common with others of this group is of low milling value. Because of this, millers especially should discourage its cultivation.

In South Australia this variety is known as "Gallant."

Sowing Rape with a Wheat Drill.

The ordinary wheat drill, without a special attachment, is not usually considered suitable for sowing rape in drills. Mr. F. C. Rowlands, of "Werribee," Waugoola, has, however, found a method by which the wheat drill can be used for sowing rape without the implement being altered in any way. His plan is to mix bran with the rape and sow the mixture through the wheat chamber. He has now completed sowing 70 acres in this way, and finds that the seed has been distributed very evenly. The bran and rape were mixed together in equal proportions. The drill was set to sow 20 lb. of wheat per acre, and the mixture was sown down every second tube. The rape was distributed at the rate of 4½ lb. per acre.

Other farmers report satisfactory results from the practice of mixing rape with superphosphate and sowing the mixture through the fertiliser tubes.

Sprouted Grain.

The late and untimely rains at harvest time have been the cause of some of the unharvested grain becoming sprouted. This grain will not be in demand by millers, and farmers who are unfortunate enough to possess such grain will be desirous of knowing what value it has for seed.

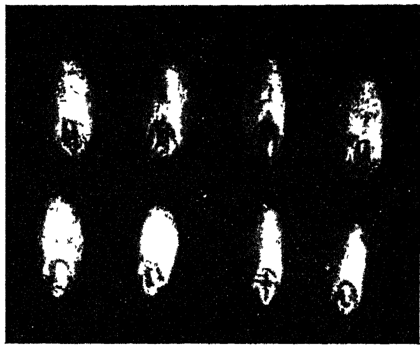
Through the courtesy of Mr. G. C. Knight-Gregson, "Camden Springs," Rocky Ponds, who supplied samples of such sprouted grain, it has been possible to conduct trials to ascertain the percentage of such grains that would germinate.

The samples received contained sound as well as sprouted grains. The relative number of each kind was determined by separating the sound grains from the sprouted once. The sprouted grains were again divided into two classes, viz., slightly and badly sprouted. Grains were said to be sound when the coat surrounding the germ was uninjured, as far as could be seen by the unaided eye. They were considered to be slightly sprouted when the coat had just been cracked by the young plant, and badly sprouted when the coat was broken by the young plant, the tip of which could be plainly seen.

The result of the division was as follows:—

Character of grain.	Actual number of grains.	Percentage of grains.	
Sound seeds ...	... 2,457 ...	... 57·8	
Sprouted slightly ...	... 802 ...	... 19·8	42·2
" badly ...	... 991 ...	... 23·3	

A preliminary trial was made to ascertain the percentage of seeds which would germinate, after such had been treated in the ordinary way to prevent "smut."



Samples of seed used in "Sprouted Grain" Test (Enlarged).
A. Badly sprouted. B. Sound grain.

Two lots of the mixed grain (sprouted and unsprouted), each of 500 seeds, were treated respectively with bluestone and with bluestone and lime-water. After being treated, these seeds were planted in nursery boxes, and the soil was kept moist, so that the conditions for germination would be as favourable as it was possible to make them. The seeds were planted on 27th January, and watered daily. Ten days later it was considered that the trial was completed. It was then found that of the seeds treated with—

Bluestone ... ... 372, or 74·4 per cent. had germinated.
Bluestone and lime... 405, or 81·0 ,, ,,

It will be seen that under conditions favourable for germination a very satisfactory proportion of the grain in the mixed sample germinated, and that the bluestone and lime treatment for smut was less destructive by about 6 per cent. than bluestone alone. It was also noticed that the growth following the double treatment was the more vigorous.

It is evident that some of the seeds actually damaged by rain to such an extent as to cause partial germination, sprouted for the second time when sown under very favourable conditions. In order to determine the actual percentage of seeds in each class that would germinate under ordinary conditions, a second and more comprehensive trial was arranged. In this trial the germination value of each class of seed (sound, badly sprouted, and slightly sprouted) was determined. Portions of each class were respectively untreated, treated with bluestone, and with bluestone and lime-water.

Mr. J. K. Murray, who carried out the trials, reports that the seed was planted as in the first trial in nursery boxes; but in the second trial the soil was only humid, and not as moist as in the first. Its condition was such as would represent the condition of the soil at planting time in a normal season. The seeds were planted on 7th February, 1911, and were not watered until the eleventh day after being planted.

The results, just prior to the watering, showed that under the dry conditions prevailing, the effect of the fungicides upon the sprouted grain—whether slightly or badly sprouted—was very injurious. It was deemed advisable to apply water at this time to prevent the soil in the boxes from completely drying out as the result of the hot weather and winds. It was feared that if this took place the experiment would be vitiated, as the seeds which had started to germinate would perish.

The results of the germination on different dates are given in the attached table :—

Seed.	Treatment.	No Planted.	No above ground on following dates.							Percentage which had germinated at last count	Percentage killed by treatment
			10/2/11	11/2/11.	13/2/11.	14/2/11	17/2/11.	18/2/11.	27/2/11.		
Sound	None .	500	.	.	1	25	341	340	413	82 6	
,, . ..	Bluestone, 2 % . .	500	12	60	200	300	295	296	355	71·0	11 6
,, ..	Bluestone, 2 %, and Lime-water.	500	7	120	300	300	299	298	383	76 6	6 0
Slightly sprouted .	None	200	27	57	100	100	145	145	153	76·5	..
,, ,, .	Bluestone, 2 % .	200	.	..	3	4	27	27	80	40·0	36 5
,, ,, .	Bluestone, 2 %, and Lime-water.	200	.	2	13	30	33	33	144	70·0	6 5
Badly sprouted	None	290	30	50	105	105	206	205	193	66 5	
,, ,, .	Bluestone, 2 % .	300	..		1	6	11	11	72	24 0	42·5
,, ,, .	Bluestone, 2 %, and Lime-water.	300	.	.	3	19	19	19	125	41 6	24·9

Other experiments at Cowra have shown that the germinating capacity of sound grain under field conditions is about 86 per cent.; so these results show that the germinating capacity of the sound grain found amongst the sprouted grain is only fair. This indicates that its vitality has been slightly impaired, though no injury is apparent to the unaided eye. The injurious effect of the fungicide or "pickle" on the apparently sound grain was not greater than is usual with other grain. Its effect upon the sprouted grain was, however, more marked. On this latter grain the advantages of using the ameliorating treatment with lime-water are very evident.

During the trial it was noticed that the plants from sprouted seeds were less vigorous than those from unsprouted ones; those from the treated seeds less vigorous than those from the untreated seeds; and those from seeds treated only with bluestone less vigorous than those treated also with lime-water.

The conclusions from these experiments are that:—(1) As sprouted grain does not produce as vigorous plants as unsprouted, it is not advisable to use sprouted grain for seed when sound grain is available. (2) Where sprouted grain *has* to be used for seed, it is advisable to sow rather more than the usual amount. The amount used should be increased by about one-fifth for dry conditions and by about one-tenth when the conditions as regards moisture are favourable for germination.

To lessen the injurious effect of bluestone, which is especially destructive to sprouted grain, treatment with bluestone should be supplemented by treatment with lime-water.

Black Oats.

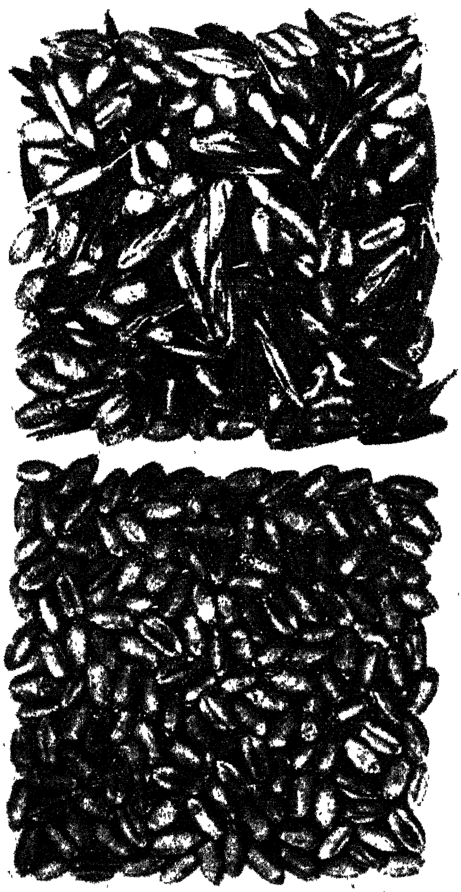
The accompanying illustrations show how effectively some machines separate the "black oat" seed from the wheat grain with which it may be mixed. A is an illustration of a mixed sample of grain as it was delivered to the grader; B is an illustration of the wheat separated from the oat grain and ready for sowing without fear of infesting the clean ground with the "oat" pest.

There is an impression amongst farmers that the black oat seed will not germinate during the hot summer months, though the conditions as regards moisture are favourable for germination. To determine what foundation there was for this impression, a preliminary experiment was conducted at the Cowra Experiment Farm by Mr. J. K. Murray, who reports :—

Five hundred seeds of black oats were planted on 13th February in a nursery box, under conditions favourable for germination. They were pressed into the compacted soil and covered lightly with a layer of sand ¼ inch thick. Immediately after planting they were well watered. The soil was kept moist during the course of the experiment.

Fourteen days after planting. 83 seeds had germinated, and a week later another 35 plants were seen above the surface. At this stage the experiment terminated, for, as the result of a mistake, the soil in the box was emptied out.

The results conclusively show that, if moisture be abundant, some black oat seeds will germinate during one of our hottest months; though the percentage germinating, viz., 24 per cent., is not large. As there is no data with reference to the germinating capacity of these oats in other months, no relative comparisons can be made. As the oat seeds were three weeks in the soil, it seems that the black oat is slower to germinate than wheat. Under the same conditions, the time the oats were in the soil would have been ample for nearly 90 per cent. of wheat seeds to germinate.



"Oaty" and "Clean" Seed Wheat.
A. As delivered to the machine. B. After cleaning by the machine.

It is obvious that either the germinating power of the "oat" is less than that of wheat, or the germination of some of the "oat" seeds is suspended.

Experiments with Red Oil Emulsion against Green Aphis on Peach Trees at Glen Innes Experiment Farm Orchard.

An experiment was carried out last season at the Glen Innes Experiment Farm Orchard with the use of red oil emulsion on peach trees against aphis.

Strength of Mixture.—The emulsion was mixed in the ordinary way in the following proportions:—1 gallon red oil, 1 lb. common yellow soap, 20 gallons water.

Time of Application.—It was applied when the trees were quite dormant, on 29 July, 1910. The relative position of the treated trees and untreated check trees is interesting, as they were so placed as to make the test thorough. There were three trees, each of the following varieties, all in one row:—Elberta, Hales' Early, High's Early Canada, and Triumph.

Two trees of Elberta and the centre tree of each three of the other varieties were sprayed with red oil emulsion, so that, except in one case, all the treated trees had untreated trees on both sides by which they could become infected.

Result.—On 30 September, 1910, green peach aphis were found on all the untreated trees, but none could be found on those sprayed with red oil emulsion.

On 1 October, the untreated trees were sprayed with tobacco water, and again on 7 October, which cleared them of the pest. It was remarkable that it took only two sprayings with tobacco water to clean the untreated trees, as the green aphis twists the leaves and hides in the folds, making it very difficult to reach it with the spray. These hidden aphides breed up again very quickly after each spraying. I have seen cases where, even with repeated sprayings at frequent intervals, green aphis has remained till all the foliage has dropped from the tree.

The trees sprayed with red oil emulsion were given no further treatment, so that if any aphides were on them they would have every chance of breeding up and making their presence noticed without doubt. A few were noticed round the bottom of the trunks of the treated trees; but apparently the oil was distasteful to them, as after several close inspections none were found on the foliage of these trees.

Advantages.—Should the use of red oil emulsion prove so absolutely successful against green aphis in further trials as it did this year, it will have many advantages over other treatments.

It is applied when the trees are dormant. Thus the trees are more easily sprayed, and at a time when there is not such a rush of work as later in the year.

Only one spraying (if the results are always as successful as this year) is necessary; whereas if later treatment is relied upon, many may be necessary.

There is less chance of interfering with the setting of the fruit.

It is almost unfortunate that black peach aphis did not appear here last season, so that the efficacy of red emulsion could have been noted against that pest also.—W. Le Gay Brereton, Orchardist.

Barley.

G. M. McKEOWN, Manager, Wagga Experiment Farm.

THE production of malting barley, although it is one of the most profitable branches of cereal growing, is a comparatively neglected industry. The demand is far in excess of the supply; the imports for 1909 having been valued at £41,340.

Large areas of suitable land are to be found throughout the southern districts, where the rainfall is ample for the production of grain of the required degree of plumpness, and where almost perfect weather conditions exist for harvesting with a view to retaining the bright colour desired by maltsters.

On the Wagga Farm during a number of years the average yield of barley of the best kinds has been about 8 bushels per acre in excess of the grain obtained from the leading varieties of wheat. On more suitable soil much better results may be looked for. The cost of production is but slightly in excess of that of wheat, the difference being an increase in cost of harvesting, due to the presence of the awns or beards on the barley; and as for some years the price of malting grain has been from 4s. per bushel upwards, it may be realised that the industry has been profitable to those who have engaged in it.

Last season's yields from well-known varieties were as follow:—

Golden Grain	39 bushels	21 lb.	per acre.
Kinver	37 ,,	6	,, ,,
Goldthorpe	32 ,,	42	,, ,,

Soil and Cultivation.

The soil most suitable for the production of malting grain is light, friable loam, having good natural drainage. Heavy black or red soils should, where possible, be avoided, as their tendency is to produce an excessive growth of straw at the expense of the grain, which is apt to be pinched and thick-skinned in consequence.

The land should be ploughed as deeply as the depth of the soil will admit, and in the event of fallowing not having been practised, the work of ploughing should be done as early as possible before sowing, so as to admit of the reception and retention of as much moisture as possible. Should the interval between ploughing and sowing be extended, light cultivation for the purpose of retaining moisture should be given, the final pulverizing operation being carried out just prior to sowing. A fine seed-bed is essential.

Varieties, Seed and Treatment.

A considerable number of varieties have been tested here, comprising the two, four, and six-rowed classes; but the two latter have been abandoned in favour of the two-rowed type.

Tests have also been made of what were known as "beardless" varieties, but they were very unsatisfactory. The abbreviated awns proved impossible to detach from the grain, which they almost equalled in bulk, the grain being pinched. The United States Department of Agriculture has recently evolved a type which appears to be quite free from objectionable features in this respect, it being practically awnless.

Varieties of the Chevalier type, viz., Kinver, Golden Grain, and Goldthorpe, have proved the most satisfactory, both in yield and quality of grain. Crops ranging up to 40 bushels 37 lb. per acre have been harvested. In 1902, with a rainfall of 875 points from 1st January to 30th November, the yield was 9½ bushels from Kinver. Goldthorpe has usually produced the best quality of grain, but Kinver has proved the most successful cropper during a number of years.

Only the plumpest seed should be used, and it should be free from grains which have been cracked or otherwise injured. About 30 lb. per acre should be sown with the drill.

The best time for sowing is from mid-April to the end of May, the time varying to some extent according to the locality and the altitude. The seed should be treated for smut in a similar manner to that in use for wheat.

Thoroughly dissolve 2 lb. sulphate of copper crystals of best quality in 100 lb. (10 gallons) of water, and immerse the grain, either in a perforated copper vessel or a porous bag, for about three minutes, then allow to drain and afterwards to dry for an hour. In order to check the corrosive effect of the bluestone, the seed should then be immersed in lime-water, made by dissolving 1 lb. of hot lime in 100 lb. of water.

The clear lime-water which is available after settlement should be carefully drawn off for use, leaving the sediment behind, as the presence of free lime in the water is liable to render the seed too sticky for drill sowing.

Fertilisers.

The use of moderate quantities of fertilisers has been proved to be profitable in all seasons, the increased yield of grain having been far in excess of the cost of the manure.

Superphosphates alone have proved very successful, but in land which has been cropped for some years, potash has been added with advantage.

In one comparative trial of fertilisers, the block treated with 60 lb. of Shirley's No. 3 and 25 lb. sulphate of potash gave a return of 40 bushels 37 lb. against that from the unmanured area of 31 bushels 37 lb.

In comparatively new land, 56 lb. of superphosphate, containing 15 to 20 per cent. of water-soluble phosphoric acid, drilled with the seed, will be found satisfactory.

Harvesting.

Harvesting with the reaper and binder, with the subsequent mellowing in stooks and stacks, is by far the best method, as there are several objections to the operations of other machines. When the latter are used the crop

incurs a risk of being over-ripe when fit for their operations, thus losing the mellowing effects of stooking and stacking. The grain is more liable to be hard and flinty, and there is considerable risk of cracking and other injuries to the grain in the operation of harvesting, which lessen the value for malting. The risk of discoloration is greater, and losses frequently occur through winds threshing the crop from the brittle straw as it stands.

Grain which is damaged by cracking or by too close clipping will not germinate, and these injuries, together with discoloration by rain, materially reduce its value.

For reaping, the grain must be properly filled, the straw and ears at this stage being of a uniform golden colour. The crop should be promptly stooked as it falls from the machines, to prevent discoloration by moisture rising from the soil or falling as rain. Stooking should be carried out so as to prevent access of rain as much as possible, but so as to allow free passage of air through the sheaves.

As soon as practicable the crop should be stacked to await threshing.

In threshing, the drum of the machine should not be set close to the concave, as it is better to leave small portions of the awns adhering to the grain than to thresh it so closely as to clip the grain.

The speed of the machine should be about two-thirds of that required for threshing wheat. The absence of threshing machines need not be an insuperable bar to farmers entering upon the culture of barley, as I understand that maltsters will purchase grain which has been well prepared by other methods. Grain of lower quality will always sell well for feeding purposes, thus providing a profitable market even for the lower grades.

Quality.

While the grain need not be of very large size, it should be even in grade, well filled, plump and thin-skinned, and white and floury in appearance when broken. The colour should be bright and free from stain such as is caused by dampness during harvest, by excessively heavy stooking, or careless storage.

For Green Fodder and Silage.

For feeding purposes, the Skinless variety will be found superior to all others in quality, whether used green or dry, or as silage. The freedom from the awns or beards which are characteristic of the other kinds is also a great advantage, as they are objectionable, and liable to become injurious when in an advanced stage of growth. It was considered that the process of ensilage would soften them sufficiently to remove this objectionable feature, but careful observation has shown us that awns which are fairly soft on removal of the silage from the stack soon become hardened by exposure to the drying effects of the sun and air.

We therefore use the Skinless variety only for feeding purposes. It is earlier than the other kinds, and being fairly drought-resistant, it is more suitable for cultivation in districts having a moderate rainfall.

In all the lower parts of Riverina it may be sown for fodder production as early as March, while May is the best month for sowing for grain. For the former purpose, seeding should be at the rate of ¾ bushel per acre, ½ bushel being sufficient for grain.

The best commercial manure we have tried is Shirley's No. 3, used at the rate of 80 lb. per acre, containing—

Phosphoric acid (soluble)	13 per cent.
Ammonia	4 „
Pure potash	2 „

As a grain producer, satisfactory results are usually obtained from the Skinless variety. In 1908, 42 acres yielded 1,300 bushels, the major part of which was sold at 5s. to 6s. per bushel. Prices, however, are now lower, but the demand for seed at profitable figures is large.

The following are the analyses of Skinless barley straw and of silage made from a crop of barley of the same variety with peas. The analyses were made by Mr. F. B. Guthrie, Departmental Chemist, of products from the Wagga Farm:—

Threshed Skinless Barley Straw—	per cent.		
Moisture	10·08	Nutrient value	53·1
Ash	5·04	Albuminoid ratio	1 : 12·7
Protein...	4·00		
Crude fibre	33·08		
Nitrogen free extract ...	46·74		
Ether extract (fat or oil) ...	1·06		
	100·00		

No. 1 *Silage, Skinless Barley*—	per cent.		
Moisture	70·28	Nutrient value	21·8
Ash	2·50	Albuminoid ratio	1 : 5·2
Fibre	7·42		
Albuminoids	3·50		
Carbohydrates	14·64		
Fat or oil	1·66		
	100·00		

No. 2 *Silage*—	per cent.		
Moisture	73·80	Nutrient value	17·7
Ash	2·52	Albuminoid ratio	1 : 5·3
Fibre	7·09		
Albuminoids	2·81		
Carbohydrates	12·87		
Ether extract (fat or oil) ...	·91		
	100·00		

Calculated to dryness—	per cent.
Ash	9·62
Fibre	27·06
Albuminoids	10·73
Carbohydrates	49·12
Fat or oil	3·47
	100·00

Marshall's Oil Ploughing Tractor.

On the 31st January last, Mr. George Valder, Chief Inspector of Agriculture, visited Illabo, near Junee, for the purpose of witnessing a trial of Marshall's Oil Ploughing Tractor, held in a stubble paddock on Mr. H. Tarleton Phillips' farm. The following is Mr. Valder's report:—

The land was in good ploughing condition, being fairly moist, and yet not too wet for the engine to travel over it. The engine used was Marshall's Class E 12-horse power Colonial Oil Tractor, which, it is claimed, is equal to an ordinary 8-horse power steam

Trial of Marshall's Oil Ploughing Tractor, at Illabo.

engine. Two 5-furrow mould-board gang ploughs were used. These were at first tried at a depth of 3 to 4 inches, and later at a depth of 5 inches. The engine easily drew these ploughs at the latter depth at the rate of from 2 to 2¼ miles per hour. This means that with a 10-furrow plough this engine would plough about 1½ acres per hour 5 inches deep. Much, of course, depends upon the length of the furrow, as turning frequently means considerable loss.

The weight of the engine was said to be 7¾ tons, and the cost, delivered in Sydney, £725.

Two men are required to work the outfit; one could easily look after the engine and the other the ploughs. The cost of ploughing in English trials is given at 3s. 1d. per acre, 6 inches deep, and I do not think that this cost is likely to be exceeded here; in fact, it ought to be reduced, as the areas to be ploughed are so much larger and, therefore, the engine would get through very much more work.

These engines appear to be suitable for the large wheat-growing areas, especially where timber for fuel is scarce. If the 24-horse power engine is used and the area to be ploughed is so large that frequent turnings are not necessary, the cost of ploughing would be greatly reduced; in fact, I do not see why it could not be done for from 2s. to 2s. 6d. per acre.

Very great interest was taken in the trial, about 100 farmers attending. Some of them came from very long distances.

This is, I understand, the first of these engines to be imported, but others are under order and will be sent out as soon as the firm can supply. The engines being new, and the operators new to the work, no very accurate trial could be made, but sufficient was demonstrated to convince the spectators that this class of engine has come to stay. The ploughing done was not as good as it should be, being rough and uneven, but this was due to the plough not being suitable for the work, and is a matter that can soon be remedied.

The agents for these engines are Messrs. R. L. Scrutton & Co., Ltd., 161, Clarence-street, Sydney. The cost of ploughing in England, referred to by Mr. Valder, 3s. 1d. per acre, was worked out by the firm from a test on 21½ acres of stiff stubble land, using a 6-furrow plough, and working 6 inches deep with 10-inch bottoms. Charges were made for oil, lubricating, grease, cotton waste, water, wages of engineer and two ploughmen, interest, and depreciation. The firm have been invited to make another demonstration at the Wagga Experiment Farm, which they have promised to do when another shipment of engines arrives, and in connection therewith the cost of working under our conditions will be ascertained.

Horse-shoeing.

We regret that the continuation of this series of articles must be held over this month. It is necessary to publish results of experiments with varieties of wheat, "pickles" for bunt, and other seasonable matter in this issue, and our space is limited. But in May *Gazette* the notes on horse-shoeing will be continued.

Varieties of Fruit for the Dorrigo.

Mr. W. J. Allen, Fruit Expert of this Department, recommends that the following varieties of fruit be tried on the Dorrigo Plateau:—

Apples: Jonathan, Buncombe, Red Carrington, Gravenstein.

Pears: Bartlett, Packham's Triumph, Winter Nelis, Beurre Cap.

Mr. Allen does not recommend the growing of stone fruits, owing to the prevalence of fruit-fly and the distance from market.

Varieties of Barley Recommended by the Department of Agriculture.

In March *Gazette*, page 237, it was stated that *Standwell* was considered the best variety of malting barley for the drier districts. This variety is drought-resistant, and extremely hardy, and has proved best at Bathurst Experiment Farm; but at Wagga Farm, where of course the conditions are vastly different, the best varieties have proved to be ***Kinver***, *Golden Grain*, and ***Goldthorpe***, in the order named.

Some Experiments with Fungicides used for the Prevention of "Stinking Smut" (Bunt), Cowra, 1910.

F. DITZELL AND R. G. DOWNING, Cowra Experiment Farm.

THESE experiments are in continuation of those carried out in previous years at the Cowra Experiment Farm.

With the exception of salt water, all the fungicides used last year were given a further trial. Several other preparations were also included, for reasons which will be shown later. The following is a complete list of those used:—

(1) A $\frac{1}{4}$ per cent. solution of Formalin.
(2) A 2 per cent. solution of Bluestone.
(3) A 2 per cent. solution of Bluestone, supplemented by immersion in lime-water.
(4) Bordeaux Paste—a proprietary preparation for use in orchards.
(5) Fungusine—a proprietary preparation for use in preventing cereal diseases.
(6) A 2 per cent. solution of Bluestone, to which was added 33 per cent. salt.
(7) A 2 per cent. solution of Bluestone, to which was added 18 per cent. salt.
(8) A 2 per cent. solution of Bluestone, to which was added 2 per cent. salt.
(9) A 2 per cent. solution of Bluestone, supplemented by immersion in water.
(10) Lysol, a well-known disinfectant. One per cent. and $\frac{1}{2}$ per cent. solutions were used.
(11) Scalecide—a proprietary "orchard fungicide." This was given a trial at the request of the vendors. Two solutions were used, viz., 1 part in 15 parts of water, and 1 part in 25 parts of water.

Objects of the Experiments.

The present experiments have been designed to furnish answers to the following questions:—

(I) To what extent do certain fungicides (or "pickles") destroy the spores of bunt ("smut") on the seed grain, and so prevent the occurrence of the disease in the crop resulting from the planting of the treated grain?
(II) Have these fungicides an injurious effect upon the vitality and vigour of the seed grain?
(III) Do these fungicides prevent reinfection to any appreciable extent?

(IV) In connection with the combined treatment with Bluestone and Lime-water, is it detrimental in any way to delay the immersion of the grain in Lime-water for some time after the draining consequent upon its treatment with Bluestone?

(V) In what proportion should the salt be added to the Bluestone solution to obtain the best results from Bluestone and Salt solution as a fungicide?

(VI) Does Fungusine depend for its efficiency on the solution only, or is it also necessary to make use of the insoluble portion of the preparation by keeping the latter well stirred into the solution when treating?

(VII) Can the harmful effects of the Bluestone solution upon the germination of the seed be counteracted by a supplementary immersion of the latter in water without detracting from its efficiency as a fungicide?

The general scope of the investigations was the same as in previous years, with such omissions and additions as the results of the former experiments indicated as being desirable.

Treatment with salt water has been omitted, because Mr. McAlpine's results were confirmed, and it was considered inefficient as a bunt preventive.

Treatment with Bordeaux Paste has been included in these trials in place of Bordeaux Mixture.

Bluestone solution and Water was included at the suggestion of Mr. R. W. Peacock, Manager of the Bathurst Experiment Farm, for the reasons given above.

Preparation of Materials.

The procedure adopted in dealing with the various plots was similar to that of previous years, and was as follows:—

The *Bluestone* (2 *per cent.*) *solution* was made by dissolving bluestone in water at the rate of 2 lb. of bluestone to 10 gallons of water.

The *Lime-water* used was a thin milk of lime, and was made by slaking freshly-burnt lime with water, using about 1 lb. of lime to 20 gallons of water.

The *Bluestone and Salt* (33 *per cent.*) *solution* was prepared by adding to a 2 per cent. solution of bluestone as much salt as the latter would absorb in two hours.

The *Bluestone and Salt* (18 *per cent.*) *and Bluestone and Salt* (2 *per cent.*) *solutions* were obtained by adding the requisite amounts of salt to measured quantities of 2 per cent. Bluestone solution.

The *Bordeaux Paste* was made up as directed by the vendors, viz., 2 parts to 500 parts of water.

The *Formalin solution* was prepared by adding 1 part of commercial formalin (40 per cent.) to 400 parts of water.

Untreated Grain.—In order that only heavy grain ("sinkers") should be used in the plots to be sown with untreated seed, as well as on the plots treated with fungicides, the light grains were removed from the whole of the grain to be used in the experiment by pouring it gently into a vessel

containing cold water, the light grains ("floaters"), chaff, &c., which remained on the surface being removed, and the remainder of the grain dried. This operation was done rapidly enough to prevent the grain becoming more than wetted on the surface. Grain not treated in any other way was regarded as untreated.

Grain treated with Formalin, Bluestone, Bluestone and Salt, or Bordeaux Paste.—The seed for each plot was placed in a suitable vessel and a solution of the required strength poured over it. The grain was then stirred, to ensure that every grain would be thoroughly wetted. After it had been immersed for five minutes, the solution was poured off and the seed dried in the sun or hung up to drain, as the nature of the experiment demanded.

Grain treated with Bluestone and Lime-water.—The seed for each plot was immersed in a solution of bluestone for five minutes, and after the solution of bluestone had been poured off, lime-water was poured on the seed and allowed to remain for about three minutes, the grain in the meantime being stirred about.

Grain treated with Fungusine.—Fungusine was used in two ways, viz., (*a*) "Solution only," in which the sediment was allowed to thoroughly settle, and then the remaining solution was drained off and used; (*b*) "As recommended by the proprietors," in which case the sediment was kept well stirred into the liquid. The material, which is in the form of a fine powder, was thoroughly mixed at the rate of 1 lb. to 1 gallon of water, after which it was poured over the prescribed quantity of grain, and the whole was stirred constantly to ensure thorough mixing.

Infected or Smutted Seed.—Seed of the different varieties was thoroughly infected with "smut" by being shaken about in a suitable vessel with a quantity of crushed-up bunt-balls, until the wheat grains were thoroughly covered with smut spores and presented the appearance of having been rolled in soot.

A laboratory experiment was carried out at the Bureau of Microbiology last year, by Mr. G. P. Darnell-Smith, in conjunction with the tests at Cowra, and his deductions will prove interesting. He says:—

> The largest number of spores became entangled in the tuft of hairs at the end of the wheat-grain remote from the embryo; some are found in the groove at the side of the grain, and comparatively few elsewhere. . . . . If a wheat-grain be dropped into water, it will be observed that it carries down with it a certain amount of air entangled in the tufts of hair at its end, and also in the groove on one side of the grain. At these places the surface of the grain does not become wetted, even after long soaking. A tuft of hairs is a mechanism frequently employed by plants to prevent a surface being wetted. In this case it prevents the bunt-spores lodged in it from being attacked by a fungicide.

In consequence of these observations, special care was this year taken to stir the seed about thoroughly whilst soaking and so dislodge the air-bubble referred to.

Procedure in Conducting the Experiments.

In these experiments, the examination of the relative effects of the different fungicides upon the vitality of the seeds has been made by comparing the number of germinations which resulted from seeds planted after being treated

in a particular way, with the number of germinations resulting from planting the same number of untreated seeds at the same time.

It has been assumed that the difference between the number of germinations resulting from the planting of untreated seed and that resulting from the planting of seed treated in some particular way, is the number of seeds which have been killed by that particular treatment. It will be noted in some cases that the actual number of germinations from treated seeds is greater than the germinations from the same number of untreated seeds—that, in fact, treatment with a fungicide has apparently had the effect of increasing the germinating quality of the grain. In such cases the sign of subtraction (–) has been placed before the figures in the column denoting the number apparently killed by the fungicide. This is apparently an anomaly, but it is in accordance with the results obtained previously, and it is therefore reasonable to suppose that a certain number are destroyed by natural causes after being planted in the field; also that certain methods of treatment protect the grain from destruction in this way. Such a condition makes comparisons difficult.

Next to each plot (two rows), containing 500 treated seeds, was planted one row of 250 untreated seeds to act as a check against possible irregularities.

The soil on which the experiments were planted was a chocolate granitic loam—typical wheat land. It was free enough to be suitable for the purpose, and as uniform in texture and as even in character as one could expect to obtain. It was in excellent tilth, very moist, and inclined to be cool, while the conditions for germination throughout the trial were very favourable, although germination was slow.

The following details of the rainfall for the fortnight immediately prior to, and that immediately following, the days of planting this year and last year, will prove interesting for comparison in conjunction with the reports, and will possibly explain some of the differences between the two years results:—

1909.	Points.
July 2	13
" 8	16
Date planted, July 14.	
July 14	10
" 21	6
" 27	4
" 28	4
Total Rainfall...	53

1910.	Points.
July 15	6
" 16	3
" 17	4
" 19	215
" 20	3
" 23	3
" 24	7
Date planted, July 29.	
July 29	42
" 30	14
Aug. 2	5
" 3	1
" 5	3
" 10	13
Total Rainfall...	319

Every possible care was taken to have the whole of the seed planted under conditions as uniform and regular as possible, the experience gained with the previous experiments of this character being helpful in this direction. The seed, one grain at a time, was dropped by hand in holes which were made a regular uniform depth ($1\frac{1}{2}$ inches) and distance apart ($3\frac{1}{4}$ inches) by means of a toothed wheel. The seed, after it was dropped, was compressed into the moist soil by having a heavy wheel rolled over it, and it was then covered with loose earth by means of a rake.

The counting of the plants was commenced soon after they were observed to be well above the ground, and was continued at intervals until it was considered no more plants would appear.

SECTION I.

OBJECT.—*To determine to what extent the different "pickles" or fungicides destroy the spores of "smut" (bunt) on the seed grain, and so prevent the occurrence of smut in the crop resulting from the planting of the treated grain.*

The relative efficiency of the different methods was determined by ascertaining the number of smutty plants which were produced after thoroughly infected seed had been treated according to the various methods under trial. For purposes of comparison, plots of infected but untreated seed were also sown.

The number of smutty plants was determined by making an examination of the plants in the different plots at a suitable time after they had flowered. Any plant containing even only one bunt ball was considered smutty and was counted as such. The results of this examination are given in Table I.

In this table the differences between the numbers of bunty plants which are recorded as being found in the various treated plots show the relative efficiency of the different treatments.

The numbers of bunty plants found in the plots sown with infected but untreated seed show the bunt-liability of the different varieties used in the experiments.

As a result of taking an average of the three varieties under each treatment, it is found that the different fungicides were efficient in the following order:—

Bluestone and Salt (2 per cent.), with	·0	per cent. bunty plants.
Bluestone and Salt (18 per cent.), with	·0	,, ,,
Bluestone 2 per cent., with	·2	,, ,,
Bluestone and Salt (33 per cent.), with	·3	,, ,,
Bluestone and Lime-water, with	·3	,, ,,
Bluestone Solution and Water, with	·4	,, ,,
Fungusine (used as recommended by the Proprietors), with	·4	,, ,,
Bordeaux Paste, with	·5	,, ,,
Formalin (1 in 400), with	1·1	,, ,,

TABLE I.

Showing the relative efficiency of the various Fungicides in destroying the Bunt Spores on the Seed Grain.

Seed infected, 26/7/10; seed treated, 29/7/10; seed planted, 29/7/10.

Method of Treatment after Infection.	No. of Seeds of each variety planted.	Bobs.					Comeback.					Federation.					Average.	
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.
Bluestone and Salt, 2 % ...	500	265	...	265	100·	...	335	...	335	100·	...	313	...	313	100·	...	100·	...
Bluestone and Salt, 18 %	500	259	...	259	100·	...	351	...	351	100·	...	354	...	354	100·	...	100·	...
Bluestone, 2 %	500	325	...	325	100·	..	348	1	349	99·7	·3	407	1	408	99·8	·2	99·8	·2
Bluestone and Salt, 33 %...	500	317	2	319	99·3	·7	397	1	398	99·7	·3	351	...	351	100·	...	99·7	·3
Bluestone and Lime-water	500	400	3	403	99·2	·8	413	...	413	100·	...	384	1	385	99·8	·2	99·7	·3
Bluestone Solution and Water.	500	382	2	384	99·5	·5	394	1	395	99·7	·3	368	1	369	99·7	·3	99·6	·4
Fungusine (as recommended by proprietors).	500	422	2	424	99·5	·5	447	1	448	99·7	·3	418	2	420	99·5	·5	99·6	·4
Bordeaux Paste	500	393	...	393	100·	...	420	...	420	100·	...	409	5	414	98·8	1·2	99·5	·5
Formalin, 1 in 400 ...	500	273	1	274	99·6	·4	282	...	282	100·	...	275	8	283	97·1	2·9	98·9	1·1
Lysol, 1 %	500	331	75	406	81·5	18·5	374	30	404	92·6	7·4	349	48	397	88·0	12·0	87·3	12·7
Fungusine (solution only)	500	267	154	421	63·4	36·6	422	9	431	98·0	2·	382	55	437	87 4	12·6	83·0	17·0
Lysol, ½ %	500	258	131	389	66·3	33·7	423	13	436	97·0	3·	270	165	435	62·0	38·0	75·1	24·9
Scalecide, 1 in 15	500	204	130	334	61·0	39·0	312	84	396	78·8	21·2	268	71	339	79·0	21·0	72·9	27·1
Scalecide, 1 in 25	500	161	186	347	46 4	53·6	362	40	402	90·0	10·0	218	164	382	57·0	43·0	64·5	35·5
Untreated	2,500	537	1,243	1,780	30·2	69·8	1,599	486	2,035	76·7	23·3	837	1,014	1,851	45·2	54·8	52·0	48·0

Lysol (1 per cent.), with	12·7 per cent. bunty plants.
Fungusine (solution only), with	17·0 ,, ,,
Lysol (½ per cent.), with	24·9 ,, ,,
Scalecide (1 in 15), with	27·1 ,, ,,
Scalecide (1 in 25), with	35·5 ,, ,,
And in rows planted with infected but untreated seed were found	48·0 ,, ,,

From the foregoing list it will be seen that all the fungicides tried, with the exception of lysol and Scalecide, are satisfactory bunt preventives; and although the results of one year's trial cannot be regarded as final, yet these two preparations do not give promise of being of any value as destroyers of bunt.

The following tabulated statement shows the results of this section of las year's experiment, together with those of this year, and the average for the two years :—

	1909. Percentage Bunty.	1910. Percentage Bunty.	Average Percentage Bunty.
Bluestone and Salt (2 per cent.)	......	......	......
Bluestone and Salt (18 per cent.)... ...	......	......	......
Bluestone Solution and Water	......	·4	·4
Bluestone and Salt (33 per cent.) ...	·8	·3	·5
Bluestone (2 per cent.)	2·5	·2	1·4
Fungusine (as recommended by the proprietors).	6·4	·4	3·4
Bluestone and Lime-water	7·2	·3	3·7
Bordeaux Paste	14·7	·5	7·6
Formalin	18·2	1·1	9·6
Lysol (1 per cent.)	......	12·7	12·7
Fungusine (solution only)...	......	17·0	17·0
Lysol (½ per cent.)	......	24·9	24·9
Scalecide (1 in 15)	......	27·1	27·1
,, (1 in 25)	......	35·5	35·5
Infected with bunt but untreated ..	72·5	48·0	60·2

It will be seen that the different fungicides were more efficient in 1910 than in the previous year. It is believed that this is due to the extra care taken last year as the result of acting upon the investigation of Mr. Darnell-Smith previously referred to. *This emphasises the necessity for farmers thoroughly and continually agitating their seed-grain while it is immersed in the pickle.*

SECTION II.

OBJECT.—*To determine whether certain fungicides used for the prevention of "smut" have an injurious effect upon the germination of the seed grain which is treated with them.*

This trial was conducted with three varieties. Five hundred seeds of each variety were treated by the different methods being tried. The seeds were treated at the same time, and after being treated were dried in the sun, and then planted on the same day. In Table II will be found the results from the plots in this section.

TABLE II.

Showing the Number of Seeds which, after treatment with the various Fungicides, germinated at stated periods during the trial; also the Percentage Number of Seeds which were apparently killed by the different treatments. Seed treated, 29/7/10; planted, 29/7/10.

Treatment.	No. of Seeds planted.	Bobs. No. of Plants above ground. 16/8/10	23/8/10	12/9/10	Percentage of Seeds germinated.	Percentage of Seeds killed.	Comeback. No. of Plants above ground. 16/8/10	23/8/10	12/9/10	Percentage of Seeds germinated.	Percentage of Seeds killed.	Federation. No. of Plants above ground. 16/8/10	23/8/10	12/9/10	Percentage of Seeds germinated.	Percentage of Seeds killed.	Average. Percentage of Seeds germinated.	Percentage of Seeds killed.
Fungusine (solution only)...	500	439	434	435	87·0	-2·3	431	433	437	87·4	1·0	435	437	433	86·6	·4	87·0	-·3
Fungusine (as recommended by the proprietors).	500	430	432	422	84·4	·3	458	458	456	91·2	-2·8	422	428	425	85·0	2·0	86·8	-·1
Lysol, ½ %	500	418	415	401	80·2	4·5	449	446	441	88·2	·2	445	450	442	88·4	-1·4	85·6	1·1
Bordeaux Paste	500	410	414	408	81·6	3·1	421	429	431	86·2	2·2	425	427	432	86·4	·6	84·8	1·9
Bunt spores (only)	2,500	2,081	2,081	2,045	81·8	2·9	2,194	2,211	2,177	87·1	1·3	2,146	2,146	2,124	85·0	3·4	84·6	2·1
Lysol, 1 %	500	409	411	407	81·4	3·3	401	408	408	81·6	6·8	417	414	413	82·6	4·4	81·8	4·9
Bluestone and Lime-water..	500	395	407	412	82·4	2·3	397	405	417	83·4	5·0	376	397	391	78·2	8·8	81·4	5·3
Bluestone Solution and Water.	500	381	394	395	79·0	5·7	390	398	409	81·8	6·6	378	393	390	79·0	8·0	79·6	7·1
Scalecide, 1 in 25	500	378	374	368	73·6	11·1	404	415	410	82·0	6·4	386	393	391	78·2	8·8	78·0	8·7
Bluestone, 2 %	500	285	332	361	72·2	12·5	318	353	357	71·4	17·0	388	414	416	83·2	3·8	75·6	11·1
Bluestone and Salt, 33 % ...	500	297	322	328	65·6	19·1	390	411	407	81·4	7·0	351	356	358	71·6	15·4	72·8	13·9
Scalecide, 1 in 15	500	330	342	347	69·4	15·3	388	406	397	79·4	9·0	340	347	351	70·2	16·8	73·0	13·7
Bluestone and Salt, 18 % ...	500	228	259	261	52·2	32·5	317	349	355	71·0	17·4	318	351	361	72·2	14·8	65·2	21·5
Bluestone and Salt, 2 % ...	500	198	255	270	54·0	30·7	284	328	345	69·0	19·4	268	318	320	64·0	23·0	62·4	24·3
Formalin, 1 in 400	500	262	272	275	55·0	29·7	267	278	294	58·8	29·6	291	297	293	58·6	28·4	57·4	29·3

On comparing the averages of the results of the three varieties, it is found that the treatment with—

Formalin ...	...apparently kills	29·3	per cent. of the treated grain.
Bluestone and Salt (2 per cent.)	,, ,,	24·3	,, ,,
Bluestone and Salt (18 per cent.)	,, ,,	21·5	,, ,,
Scalecide (1 in 15)	,, ,,	13·7	,, ,,
Bluestone and Salt (33 per cent.)	,, ,,	11·9	,, ,,
Bluestone (2 per cent.)	,, ,,	11·1	,, ,,
Scalecide (1 in 25) ...	,, ,,	8·7	,, ,,
Bluestone Solution and Water	,, ,,	7·1	,, ,,
Bluestone and Lime-water	,, ,,	5·3	,, ,,
Lysol (1 per cent.) ...	,, ,,	4·9	,, ,,
Bunt spores (only) ...	,, ,,	2·1	,, ,,
Bordeaux Paste ...	,, ,,	1·9	,, ,,
Lysol ($\frac{1}{2}$ per cent.) ...	,, ,,	1·1	,, ,,
Fungusine (as recommended by the proprietors)...	,, ,,	–·1	,, ,,
Fungusine (solution only)	,, ,,	– 3	,, ,,

This season's results in the case of Formalin tend further to show the varying character of this preparation. Last year it gave good germination results, but bad ones in connection with the prevention of "smut." This year the effects upon the germination are very bad, while the "bunt results" are good.

Fungusine, as was the case last year, appears to assist rather than retard germination. The actual number of plants which grew from seeds treated with both Fungusine treatments was greater than that which grew from the untreated seed; but from this it does not follow that Fungusine improves the vitality of the seed-grain. The most reasonable explanation is that Fungusine does not injure the germinating power of the seed, and that its effect is to protect the seed from those field-pests which (as these experiments show) attack and destroy it. The results this year confirm those of 1909, and show that it destroys the smut-spores in a very satisfactory manner, and has no injurious effect upon the germination. In practice, treatment with it has the disadvantage that no provision is made for the very necessary removal of any unbroken bunt-balls that may be amongst the grain, for the seed has to be treated by sprinkling and mixing "on the floor." To remove or break the unbroken bunt-balls a preliminary treatment is therefore necessary.

Bordeaux Paste gave satisfactory results in this trial, and if it maintains this position in future tests, it will prove greatly superior to Bordeaux Mixture, and a valuable fungicide.

Lysol gave satisfactory "germination results," but in the previous section it did not prove efficient in preventing bunt while the present results

indicate that it is inadvisable to use a stronger solution, for as the percentage of Lysol is increased, so do the injurious effects of the treatment upon the germination become more pronounced.

Bluestone (2 per cent.) Solution again had a destructive effect upon the germination of the seed (although not so severe as in previous years), which considerably lessens its value to the farmer, although such an effective preventive of "smut."

Bluestone and Lime-water gave, as usual, very satisfactory results in both sections of the experiment, which, when compared with those of Bluestone Solution (only) emphasise the advisability of using a supplementary immersion in lime-water in conjunction with the latter treatment.

Bluestone Solution and Water is, apparently, in "germination results," an improvement upon Bluestone Solution (only), although not quite as good as Bluestone and Lime-water.

Bluestone and Salt.—The addition of salt to the bluestone solution has not proved an advantage this year, even the solution with the largest amount of salt being slightly more injurious than bluestone alone.

Scalecide, tried this season for the first time, does not show any indication of becoming of value as a bunt preventive.

It is interesting to note that, as was the case last year, a thorough infection with smut has an appreciable injurious effect upon the vitality of the seed grain. In this case it is responsible for destroying over 2 per cent. of the seed-grain.

The following tabulated statement shows the results for the years 1906, 1909, and 1910, and also the average for the three years:—

	1906.	1909.	1910.	Average.
Fungusine (*a*) apparently killed	......	-1·3	-·1	-·7
Fungusine (*b*) ,, ,, ...	......	......	-·3	-·3
Lysol (½ per cent.) ,, ,, ...	......	......	1·1	1·1
Bordeaux Paste ,, ,, ...	......	·8	1·9	1·4
Infected (only) ,, ,, ...	......	2·5	2·1	2·3
Lysol (1 per cent.) ,, ,, ...	......	......	4·9	4·9
Bluestone (solution) and Water apparently killed ..	......	......	7·1	7·1
Bluestone and Lime-water ,, ,, ...	6·3	10·2	5·3	7·3
Scalecide (1 in 25) ,, ,, ...	......	......	8·7	8·7
Bluestone and Salt (33 per cent.) ,, ,, ...	......	8·7	11·9	10·3
Scalecide (1 in 15) ,, ,, ...	......	......	13·7	13·7
Formalin (1 in 400) ... ... ,, ,, ...	10·5	3·8	29·3	14·5
Bluestone and Salt (18 per cent.) ,, ,, ...	......	......	21·5	21·5
Bluestone (2 per cent.) ,, ,, ...	26·0	30·2	11·1	22·4
Bluestone and Salt (2 per cent.) ,, ,, ...	......	......	24·3	24·3

There are some slight variations in the results of the respective years. The most striking and interesting is in the case of Bluestone (2 per cent.). The explanation of this difference appears to be the varying conditions at planting time in the experiments (seen from the foregoing details of rainfall), which in this season's experiment would be more favourable to the bluestone treatment, as tending to dilute the solution of bluestone round the young plant.

SECTION III.

OBJECT.—*To determine whether any of the fungicides used prevent reinfection by smut of the seed treated with them.*

Seed of the three varieties was treated according to the different methods under trial, and, after being dried, was then infected with bunt in the manner described. The seed after being infected was planted. Plots were also planted with untreated but infected seed, in order to ascertain the degree of infection to which the treated seed was subjected.

The ability of the different fungicides to prevent reinfection was determined by the relative number of clean and bunty plants found in the resulting crop. The larger the proportion of clean plants, the greater the ability of the particular fungicide to prevent reinfection.

The proportion of clean plants was determined by an examination made after the plants had flowered. In Table III will be found the results of this examination. By taking the average of the three varieties under each treatment, it is found that the fungicides are effective in preventing reinfection in the following order:—

Bluestone and Salt (33 per cent.) ...	with	99·4	per cent. of clean plants.
Bluestone and Salt (18 per cent.) ...	„	98·8	„ „
Bluestone and Salt (2 per cent.) ...	„	98·8	„ „
Bluestone (2 per cent.)	„	96·6	„ „
Bluestone and Lime-water... ...	„	96·5	„ „
Fungusine (as recommended by the Proprietors)	„	96·4	„ „
Bordeaux Paste	„	93·6	„ „
Bluestone Solution and Water ...	„	93·0	„ „
Fungusine (Solution only)	„	81·0	„ „
Scalecide (1 in 15)	„	72·9	„ „
Lysol (1 per cent.)	„	71·5	„ „
Formalin (1 in 400)...	„	67·2	„ „
Lysol (½ per cent.)	„	62·2	„ „
Scalecide (1 in 25)	„	54·8	„ „
And seed untreated and infected with bunt spores	„	52·0	„ „

Best results, when bunt prevention alone is considered, were again obtained from the use of Bluestone and Salt, but the bad germination results in the case of this treatment place Bluestone (2 per cent.) at the head of the list, although, strictly speaking, there is so little difference in the results from the first six treatments that they cannot be separated.

Scalecide, Lysol, Formalin, and Fungusine (solution only) are poor in preventing reinfection.

The advantage of a method which in addition to destroying the smut spores on the seed grain, also prevents the reinfection of that grain, may not be at first realised. When, however, it is understood that the possibility of treated seed becoming reinfected is very considerable as the result of being placed in old bags or bins, or sown through machines which have held smutted wheat, the value to a farmer of a treatment which will aid in preventing reinfection is at once apparent.

TABLE III.

Showing the extent to which each of the Fungicides prevents reinfection after treatment.
Seed treated, 29/7/10; infected, 29/7/10; planted, 29/7/10.

Treatment.	No. of Seeds planted.	Bobs.					Comeback.					Federation.					Average.				
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.
Bluestone and Salt, 33 % ...	500	270	2	272	99·3	·7	348	2	350	99·4	·6	335	3	338	99·1	·9	318	2	320	99·4	·6
Bluestone and Salt, 18 % ...	500	280	2	282	99·3	·7	382	5	387	98·7	1·3	342	5	347	98·6	1·4	335	4	339	98·8	1·2
Bluestone and Salt, 2 % ...	500	248	4	252	98·4	1·6	249	3	252	98·8	1·2	250	2	252	99·2	·8	249	3	252	98·8	1·2
Bluestone, 2 %	500	323	21	344	93·9	6·1	368	4	372	98·9	1·1	352	12	364	96·7	3·3	348	12	360	96·6	3·3
Bluestone and Lime-water ...	500	314	18	332	94·6	5·4	261	6	267	97·8	2·2	331	8	339	97·6	2·4	302	11	313	96·5	3·5
Fungusine (as recommended by Proprietors).	500	281	101	382	73·6	26·4	395	26	421	93·8	6·2	318	103	421	75·5	24·5	331	77	408	84·8	15·2
Bordeaux Paste	500	330	54	384	85·9	14·1	406	21	427	95·1	4·9	400	4	404	99·0	1·0	379	26	405	93·6	6·4
Bluestone Solution and Water	500	332	65	397	83·6	16·4	396	7	403	98·2	1·8	397	12	409	97·0	3·0	375	28	403	93·0	7·0
Fungusine (solution only) ...	500	281	101	382	73·6	26·4	395	26	421	93·8	6·2	318	103	421	75·5	24·5	331	77	408	84·8	15·2
Scalecide, 1 in 15	500	210	115	325	64·6	35·4	308	64	372	82·8	17·2	240	103	343	70·0	30·0	253	94	347	72·9	27·1
Lysol, 1 %	500	211	173	384	54·9	45·1	372	37	409	91·0	9·0	266	130	396	67·2	32·8	283	113	396	71·5	28·5
Formalin, 1 in 400	500	133	116	249	53·4	46·6	202	23	225	89·8	10·2	181	113	294	61·6	38·4	172	84	256	67·2	32·8
Lysol, ½ %	500	207	176	383	54·0	46·0	321	101	422	76·1	23·9	221	180	401	55·1	44·9	250	152	402	62·2	37·8
Scalecide, 1 in 25	500	44	327	371	11·9	88·1	299	77	376	79·5	20·5	156	199	355	43·9	56·1	166	201	367	45·2	54·8

SECTION IV.

OBJECT.—*To determine whether, in connection with the combined treatment with bluestone and lime-water, it is detrimental in any way to delay the immersion of the grain in the lime-water for some time after the draining necessary because of its treatment with bluestone.*

This section was subdivided into two divisions—(1) To ascertain the effect of the modifications on the germination of the grain; and (2) to ascertain the effect of the modifications in preventing bunt in the resulting crop.

Seed of each of the three varieties was treated with a 2 per cent. solution of bluestone, and was then divided into four portions, which were respectively treated with lime-water—(*a*) immediately after, (*b*) one quarter of an hour after, (*c*) one half-hour after, and (*d*) one hour after removal from the bluestone solution.

To ascertain the effect of the different modifications upon the germination, the plants were counted as they appeared above the ground, and then at intervals until it was considered that no more plants would appear. The results will be found in Table IV.

To ascertain the effect of the modifications upon the ability of the treatment to prevent smut in the resulting crop, an examination of the growing plants was made after they had flowered. This was to determine the number of bunty plants found growing in the different plots. The greater the number of clean plants in any plot, the more effective is that particular treatment in preventing bunt. The result of the examination is given in Table V.

By compiling averages of the results of the three varieties from Tables IV and V, it is found that the percentage rate of germination, and relative efficiency of the different methods, are as follow:—

Treatment with Lime-water.
- Immediately after bluestoning, 81·3 per cent. of seeds germinated; 99·6 per cent. plants clean.
- Fifteen minutes after bluestoning, 72 per cent. of seeds germinated; 98·2 per cent. plants clean.
- Thirty minutes after bluestoning, 74·3 per cent. of seeds germinated; 99·1 per cent. plants clean.
- One hour after bluestoning, 69 per cent. of seeds germinated; 98·2 per cent. plants clean.

From these results it seems that the best germination is secured by dipping the seed in the lime-water immediately after treatment with the bluestone solution, while as regards efficiency in preventing bunt, it makes practically no difference when the subsequent dipping takes place.

These figures are not quite in accordance with those obtained last year, when the germination results for the four treatments were practically similar, while the dipping in lime-water one hour after bluestoning was most efficient in preventing bunt. Any conclusions with regard to this section must, therefore, stand in abeyance until results of future experiments are available.

TABLE IV.

Showing the effect on the germination of delaying treatment with Lime-water after Bluestone; 200 seeds of each variety planted; seed treated, 29/7/10; planted, 29/7/10.

Variety.	Immediately after Bluestone.				15 minutes after Bluestone.				30 minutes after Bluestone.				60 minutes after Bluestone.			
	No. of Plants on—			Percentage of Plants on 12/9/10.	No. of Plants on—			Percentage of Plants on 12/9/10.	No. of Plants on—			Percentage of Plants on 12/9/10.	No. of Plants on—			Percentage of Plants on 12/9/10.
	16/8/10.	23/8/10.	12/9/10.		16/8/10.	23/8/10.	12/9/10.		16/8/10.	23/8/10.	12/9/10.		16/8/10.	23/8/10.	12/9/10.	
Bobs	158	163	165	82·5	138	140	144	72	125	129	136	68	119	130	136	68
Comeback	159	162	167	83·5	...	...	...	..	126	135	139	69·5	114	131	138	69
Federation	160	158	156	78·0	141	142	144	72	165	168	171	85·5	126	135	140	70
Average	156	161	163	81·3	140	141	144	72	139	144	149	74·3	120	132	138	69

TABLE V.

Showing the effect upon the efficiency of the "Bluestone and Lime" treatment as a smut preventative, when the treatment with lime-water is delayed after bluestoning the seed; seed treated and planted, 29/7/10.

Variety.	Lime-water immediately after Bluestone.				Lime-water 15 minutes after Bluestone.				Lime-water 30 minutes after Bluestone.				Lime-water 60 minutes after Bluestone.			
	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.
Bobs	160	99·4	1	·6	132	97	4	3	134	92·3	1	·7	130	100	...	...
Comeback	165	100	...	...	...	...	..	...	131	99·2	1	·8	135	100	...	...
Federation	155	99·4	1	·6	143	99·3	1	·7	159	98·8	2	1·2	123	94·6	7	5·4
Average	160	99·6	1	·4	137	98·2	3	1·8	141	99·1	1	·9	129	98·2	2	1·8

SECTION V.

OBJECT.—*To ascertain the correct proportion in which salt should be added to the bluestone solution to obtain the best results from bluestone and salt as a fungicide.*

Salt was added to the bluestone solution in the following proportions:—2 per cent., 18 per cent., and 33 per cent., as is explained under "Preparation of Materials." Five hundred seeds of each variety were then treated with each solution.

An average of the germination results of the three varieties thus treated, and also of the corresponding bunt results (compiled from Tables I and II respectively) is here given:—

Bluestone and salt, 33 per cent., killed 11·9 per cent. of treated grain; and 99·7 per cent. of plants were clean.

Bluestone and salt, 18 per cent., killed 21·5 per cent. of treated grain; and 100 per cent. of plants were clean.

Bluestone and salt, 2 per cent., killed 24·3 per cent. of treated grain; and 100 per cent. of plants were clean.

These figures indicate that the more salt that is added, the better is the germination, while there is practically no difference in the efficiency of the three solutions in preventing bunt. In view of even this one year's results the tentative recommendation to add 2 per cent. of salt to the bluestone solution, as an ameliorating agent, must be withdrawn, especially since the injurious effects from the additions of 2 per cent. and 18 per cent. of salt are greater than when no salt is added; although, in the latter case, the percentage of seeds killed is much lower than in previous years. Further, 33 lb. of salt per 10 gallons of bluestone solution is too expensive for a farmer's use; and, since the effect of bluestone and salt has proved variable, it must for the present be regarded as unsafe.

SECTION VI.

OBJECT.—*To ascertain if the best results in the treatment with Fungusine are obtained by the use of the "solution only," or if it is also advisable to make use of the sediment, as recommended by the proprietors.*

Details of the preparation of the two modifications of this fungicide have already been given.

An average of the "germination results," and of the "bunt results," of the three varieties treated with each (obtained from Tables I and II respectively) is given below:—

Fungusine (solution only) kills – ·3 per cent. of treated grain, and 17·1 per cent. of plants were bunty.

Fungusine (as recommended by the proprietors) kills – ·1 per cent. of treated grain, and ·4 per cent. of plants were bunty.

The "germination results" in both cases are practically the same, but when the results in connection with the prevention of bunt are considered, a striking difference is noticed in favour of the method recommended by the proprietors.

This is probably explained by the fact that when the sediment is thoroughly mixed with the grain, it remains deposited upon it. When the latter is dried it probably retains, mixed with it, a certain amount of the substance upon which Fungusine depends for its action as a fungicide. The mixture forms a protective covering round the seed, and as it is in a fairly loose form, some of it is liable to be brought into contact with any bunt spores amongst the grain which were not affected by the treatment. In the case of "solution only," when the seed is dried there is probably not sufficient of the bunt-killing substance present to form a film around the seed without the aid of some retaining medium, such as the sediment.

To obtain the best results, then, from the use of Fungusine special care must be taken to keep the sediment thoroughly worked into the seed being treated.

SUMMARY.

Bluestone, as formerly, proved to be an excellent preventive of bunt, and was also satisfactory in preventing reinfection. Its disastrous effect upon the vitality of the grain was less than in previous years—a result probably due to seasonal differences. The necessity for using an ameliorating agent is still very apparent. Lime is again recommended, whilst salt is not.

Bluestone and Lime-water.—This was as satisfactory as bluestone as a bunt preventive, and in preventing reinfection, while its destructive action upon the germination of the seed was less.

As the result of supplementing the bluestone treatment with lime-water, about 6 per cent. of the grain was saved.

In connection with this treatment, it is uncertain whether it is advantageous to delay the immersion in lime-water, rather than to dip immediately after bluestoning. No modification of present practice is, therefore, recommended, pending the results of further investigations.

Bluestone and Salt again proved an effective preventive of bunt, and also gave best results in preventing reinfection. In consequence, however, of the variable results in germination obtained from its use during the past two seasons, last year's tentative recommendation of the addition of 2 lb. of salt to the bluestone solution as an ameliorating agent must be withdrawn.

Bluestone Solution and Water proved, on the whole, slightly better than bluestone alone, although not as good as bluestone and lime-water. The supplementary dipping in water seems to lessen the destructive action of the bluestone on the vitality of the seed, whilst not detracting from its efficiency as a bunt destroyer.

Fungusine proved in this trial very satisfactory. As a smut preventive it gave practically as good results as any method tried, and again had no

injurious effect upon the germination of the seed, but rather protected it from the attacks of unseen grain pests. In preventing reinfection it was correspondingly efficient.

It must, therefore, again be regarded as the best all-round method tried, and to those who prefer a "floor" treatment it can without hesitation be recommended. Like all "floor" treatments, however, this method has one disadvantage in that it offers no facilities for the removal of the unbroken bunt balls from amongst the grain.

Bordeaux Paste gave very good results this season, and is this year a distinct improvement upon Bordeaux mixture. If it maintains this standard in future experiments it may take its place among the satisfactory fungicides.

Formalin, on account of the non-uniformity of results obtained from it throughout several years, cannot for the present be regarded as a satisfactory fungicide.

Scalecide does not give indications of becoming of any value as a fungicide, although the results of one season's trial cannot be accepted as final.

Lysol gave fair all-round results, but as a fungicide for the prevention of bunt is not expected to be of much value.

BLUE COUCH GRASS OF NEW SOUTH WALES.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

Previous reference, *Agricultural Gazette*, September, 1910, p. 789.

I HAVE been in communication with the Royal Botanic Gardens at Kew England, in regard to this matter, and Dr. Otto Stapf, the Director, has favoured me with the following provisional note. We shall look forward with interest to the note in the Kew Bulletin.

I may point out that our common Summer Grass, for many years named *Panicum sanguinale*, is now usually named *Digitaria sanguinale*, showing its close relationship to the Blue Couch which is now under discussion.

This is *Digitaria didactyla*, Willd. (*Panicum didactylum*, Kunth.). It was collected by F. W. Sieber at Port Jackson, or in its neighbourhood, as long ago as 1823, and distributed by him in his "Agrostotheca," No. 72. Nees named it first *Panicum gracile* in Schultes, Syst. Veg. iv, ii, 33, and afterwards *Panicum subtile* in Flora, 1828, p. 300, probably because he had found that there was already a *Panicum gracile*, R.Br. *Digitaria didactyla* has repeatedly been collected in the Mascarenes and in Madagascar, and is also represented in the Kew collection from Tonkin.

A note concerning the grass will be published in the Kew Bulletin.

Incubators and their Management.

G. BRADSHAW.

By the time this appears, poultry breeders will be preparing for their early hatching, and while the majority of both fanciers and utility breeders would prefer these first broods to be hatched by hens, as eggs are then not plentiful, there is the greatest difficulty in getting a broody hen in April, May, and June. Fortunately, however, the wooden hen will set at any time, is always available, and given fresh, well-fertilised eggs and intelligent attention, will hatch every bit as well as the best broody hen.

I have put well-fertilised eggs before management, because, as has been exhaustively detailed in the bulletin on "Artificial Incubation," the majority of failures in hatching with a machine are due to faulty eggs.

When poor results are obtained by hatching with incubators, the poultryman too often blames the machine, and time after time requests have come to the Department asking which is the best incubator, and mentioning a poor hatch with perhaps one of the well-known makes. My reply to such inquiries is simply that the cause of the bad results must be looked for elsewhere than in the machine.

If an incubator is put on the market, no matter what the type or name, two or three years will either witness it as an established, reliable hatcher, or it will have disappeared, to be heard of no more. There are several locally-built incubators whose name and reputation as hatchers are excellent, and those which come from America do good work. At the same time, season after season, one poultryman or another has the most shocking results from the best of them—if there be such a thing as "best"—for, just like breeds of fowls, there is no absolutely best, all under suitable conditions doing good work.

From a great deal of correspondence, it is evident that the worst failures are in the early spring months. This is most probably due to weak fertilisation in the eggs. The male birds may not have got thoroughly through their moult, or may be unsuitable in several ways for the breeding pen. Again, the trouble may be due to the hens, which may be too young, too old and fat, or indifferently fed and managed. Briefly, through the above or other causes, eggs may be totally unfertilised, or so weakly fertilised that hatching them, whether by hen or machine, would be impossible.

Failures in hatching, however, are not all due to unsuitable eggs. A large proportion of the disappointing results are the fault of management. Several such cases came under the writer's notice during the past season, and in all the instances the operators had credited the trouble to the machines.

Eggs may be kept at too high or too low a temperature, or they may not be turned regularly or properly. In winter and early spring months, when pullets are laying, their eggs are much smaller than those from the old hens; and as the heat comes from a hot tank above, while the large eggs experience the correct temperature, the small ones will be too cold in the lower level.

The incubator should be placed in a room where there are no draughts, and where the humidity remains as uniform as possible, despite the atmospheric changes. In America the bulk of the incubator rooms are cellars, or, at any rate, partially below the ground. Our more favourable climate does not necessitate such structures.

At a poultry farm visited last season, the trouble, when located, was found to be due to the thermometer, which registered 3 degrees too high. The eggs were assumedly kept at 103 to 104 degrees, when, in fact, 100 was the true register. Notwithstanding this, some twenty chicks hatched from eighty-five or ninety eggs. No doubt the strongest fertilised ones were those which produced the chickens.

When starting a new incubator, after the lamp has been lighted the ventilators and doors should be kept open for several hours, to expel all moisture. The doors can then be closed, and the instructions given by the maker carried out. The bulb of the thermometer should be placed at the same level as if resting between two eggs. The lamp should then be adjusted until the thermometer registers 102. When it remains at this for several hours the eggs can be placed in the drawer, neatly lying on their side, and the thermometer placed with the bulb resting on and between two eggs. The cold eggs will reduce the reading of the thermometer, but a few hours will adjust matters.

The temperature considered best for eggs is 103 degrees; and while that should be maintained, the rise or fall of 1 degree, all else being correct, will not affect the results.

It may be mentioned here that in a few days, when the animal heat becomes manifest in the eggs, a reduced lamp flame will be necessary.

Before placing the eggs in the drawer, an X or other mark should be put on the side of each egg. This will be a guide in turning. Have the plain side up at night, the X in daytime. Any other mark that suggests itself can be used, say D on one side for daytime, N on the other side for night. This, as will be seen, means turning the eggs morning and evening. A few operators mark their eggs in quarters—1, 2, 3, 4—and turn from 1 to 3 and then from 2 to 4, and so on.

During turning, the cooling of the eggs takes place. In the early stages of hatching from twelve to fifteen minutes is sufficient, but during the last week fifteen to thirty minutes will not be too long, and as the season advances a more lengthened time will be necessary.

Testing the eggs for fertility can be done from the sixth to the ninth day. There are several simple devices for this, but practical operators place the egg in the circle made with the thumb and forefinger, hold it before a lamp or other strong light, and in this way can test as reliably as with any of the

instruments. By this time eggs which are fertile will appear quite dark, while the infertiles will have the same clear appearance which they had when put in the incubator, and these should be removed. Some poultrymen who incubate largely, market these infertile eggs, and without expressing any opinion on the ethics of this, it may be stated that an infertile egg subjected to a temperature of 104 degrees for ten days, is a much better one than some fertilised ones of that age which have never been in an incubator.

Another test should take place on the thirteenth or fourteenth day, for although all the eggs left in from the first examination may have been fertile, through weak fertilisation some of them may have died. These can, with a little practice, be recognised. The egg feels considerably colder than those containing life, while when held up to the lamp a pronounced blood ring is seen enclosing the decomposed contents.

After the eighteenth day the incubator should not be again opened until the chicks are hatching, which, if all has gone well, should be on the eve of the twenty-first day.

During hatching the drawer should be opened but seldom, and only to remove the newly hatched chickens to the nursery drawer which is attached to most machines, and, later, from this to the brooder.

When a hatch is completed the incubator should get a thorough cleaning out—*i.e.*, scalding with hot water and some disinfectant—prior to a second run.

The advantages of an incubator are that it is always ready; you have not to wait for it to become broody; the eggs do not become stale from waiting; it never leaves the eggs, and sets where you place it. It does not break the eggs, nor trample on the chicks; it hatches a larger number, which can be brooded in large lots, and the cost of labour and rearing are thus reduced. The chicks do not acquire vermin from it as from a hen, and with moderate care will remain clean, grow rapidly, and generally be more profitable than the ones hatched and reared by the hen.

Bluestone and Lime-water for Smut.—A Caution.

A correspondent asks whether, in treating seed-wheat with bluestone and lime-water, it would not do to mix the lime in the bluestone solution, as this would save a lot of labour. Lest others should fall into this trap, it should be clearly understood that such a mixture would have little or no effect in killing smut spores. It would be practically Bordeaux Mixture, which is a very inferior pickle for smut. The bluestone and lime should *not* be mixed. The seed should be dipped into the bluestone solution; then drained; then dipped into the lime-water. Mr. Sutton explained this in March *Gazette*, page 192.

Orchard Notes.

W. J. ALLEN.

April.

Harvesting.—The work of picking, packing, and marketing apples will continue this month; also the storing of any late apples or pears in either cool stores or cool store-rooms in the orchards.

Green Manuring.—If this crop is not already in, it should be put in now with as little delay as possible, wherever such crop is to be grown among trees and vines. The soil in most of our fruitgrowing districts has had a fair soaking, and consequently the seed will germinate quickly after sowing.

Planting.—Planting of citrus trees may be continued this month. Where autumn planting is practised care should be taken in handling such trees not to expose the roots to either wind or sun. Those who intend planting out new orchards should get the land cleared and subsoiled as soon as possible, and trees secured. In buying apple-trees see that they are all worked on blight-proof stocks, as trees worked on such stocks can be easily kept free of the woolly aphis.

Refills.—The ground should be well worked up where such trees are to be planted in established orchards, and if the soil is poor or hard it would be as well to remove a load or two of the poor soil, and fill up the hole with good soil if there is any handy. Before filling up with this good soil it would be as well to sprinkle a few pounds of lime in the bottom of the hole. This will assist in sweetening the ground.

Scales on Citrus Fruits.—If there are any citrus trees on which the fruit is dirty, it would be well to fumigate immediately, if the trees are in good condition, as, if this work is done now, most of the scale will have fallen off the fruit by the time it is ready to be sent to market. Other States do not want spotted fruit, even though the scale may be dead. It is only those who have clean fruit who will be allowed to market it in New Zealand and the different States of the Commonwealth. Fumigating tables may be had on application to the Department of Agriculture.

Codlin Moth.—Bandages must still be kept on the trees, as, even after all the fruit is removed, an occasional grub finds its way to the bandages. All props should be removed from the orchard, and any grubs adhering to them destroyed.

A solution which finds great favour now is Swift's arsenate of lead, which does not burn the foliage as will the other sprays, and requires no boiling or lime, and has only to be diluted in cold water. Two pounds of arsenate of

lead to 50 gallons of water will be found quite strong enough for the first application, while $1\frac{1}{2}$ pounds is sufficient for subsequent applications. The apple-trees should be given a thorough spraying just as soon as most of the petals have fallen; then give two later sprayings, at intervals of about thirty days. At each spraying be careful to cover every part of the tree and fruit. Those who have systematically sprayed this year report that they have had very little moth-infested fruit, and that spraying when properly carried out is in every way superior to bandaging.

Specimens of Fruit.

I have to acknowledge receipt of very fine specimens of apples, pears, and quinces from growers in different parts of the State. Most of the specimens were submitted without any description of the habit or growth of the trees or any particulars whatever. I would therefore suggest, for the guidance of those who wish to submit such specimens in future, that they give a full description of the tree, when the fruit ripens, the name (if any) by which the fruit is known in the district, and any other information which may help myself or the orchardists in naming such fruit. A typical specimen should, of course, always be sent with a stem of average length.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Alumny and Carr's Creek ...	Mr. A. R. Wetherspoon, Alumny Creek, Grafton.
Bathurst	Mr. S. McKibbin, O'Connell.
Carlingford...	Mr. D. K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown...	Mr. S. A. Levick, Roseneath, Cundletown.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. J. Halloran, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The list above enumerates the places at which branches have already been formed. The members are receiving the advantage of courses of lectures by Departmental experts on subjects which are of interest to them. Every reader of the *Agricultural Gazette* should join the local branch or arrange to have one formed in his district. He cannot afford to let go by him such an opportunity of acquiring up-to-date information of modern methods in regard to his business. If a branch of the Bureau does not exist in his neighbourhood, he should write to the Department, and steps will be taken to form one.

Bathurst.

Bathurst Branch has now a membership of twenty-five.

The Sheep and Wool Expert continued his course of lectures and demonstrations on the 17th March to the members, at the Bathurst Experiment Farm.

Carlingford.

As the result of a lecture on "Fruit Culture," on the 3rd March, by Mr. Bryant, the Assistant Fruit Expert, a branch of the Bureau has been formed at Carlingford. The chairman is Mr. C. Thacker; vice-chairmen, Rev. J. Young and Mr. J. R. Gorman; treasurer, Mr. C. Franks; and secretary, Mr. D. K. Otton. The branch starts with a membership of twenty-two.

Dr. H. I. Jensen, Assistant to the Chemist, will lecture to the members on the evening of 11th April, on "Soils of the District," and other lectures and demonstrations are being arranged.

Hoxton Park.

A branch is being formed at Hoxton Park, with Mr. E. Banks as honorary secretary. A lecture on "Fruit Culture," by Mr. Bryant, is being arranged.

Inverell.

New members of this branch include Messrs. T. Bourke, S. McRae, J. Leech, H. C. Limberg, and W. J. Limberg.

Mr. McDonald, Inspector of Agriculture, recently gave an interesting address to members, and on the 15th March Mr. Veterinary Surgeon Henry lectured on "Tuberculosis in Cattle."

Little Plain.

The following new members have been elected to the branch:—Messrs. J. Cannons and T. G. Cosh, of Rob Roy; A. McDonald, W. Hicks, J. Hobbs, and — Mills, all of Little Plain.

On the 16th March, Mr. M. Henry, M.R.C.V.S., gave a demonstration in the afternoon and lantern lecture at night, on the subject of "Horses."

At the last meeting, Mr. F. S. Stening read a paper on "The Draught Horse: Its Breeding from an Australian Farmer's Standpoint."

The author considers that if horse-breeding is properly conducted, breeders will not need to fear the advent of the motor or tractor. He favours breeding on pure lines; but this is often impracticable on account of the shortage of pure-bred mares. "Breeding-up" is therefore the best policy, using pure-bred stallions on grade mares of the same breed. After five or six generations the progeny is pure-bred. Hereditary unsoundness must be avoided, and mares carefully examined, by a veterinarian if necessary, before being used for breeding. Only stallions carrying the Government Certificate of Soundness should be used. Mr. Stening also gives valuable hints on the treatment of the mare and foal.

Mr. W. White contributed a paper on "Seed Wheat."

Clean seed, free of wild oats and other strangers, is not the only requirement. Good seed should be plump, as the seed has to support the plant in its early stages; and all of one variety, or trouble will be experienced in stripping on account of differences in height and uneven time of ripening. If a farmer has not a grader, the local miller will grade the seed for about 3d. per bushel. Mr. White recommends a farmer to hand-pick enough seed to sow a quarter of an acre, and sow this separately, keeping the yield for seed. In this way a supply of pure seed will soon be obtained. He uses bluestone and lime to treat for smut.

Peak Hill.

Mr. Mathews, Sheep and Wool Expert, continued his course of instruction to the members during the month.

Stockinbingal.

The Sheep and Wool Expert lectured to the branch on the 9th March, and the members greatly appreciated the information given.

Trundle.

Mr. Mathews, the Departmental Sheep and Wool Expert, continued his course of demonstrations and lectures during March to an appreciative gathering of interested members.

Walli.

A further number of agriculturists have joined this branch, consisting of Messrs. S. Stewart and M. Kerin, of Woodstock; R. Crampton, of Walli; R. Smith, of Canowindra-road; J. Muir, junior, of Waugoola; and T. Boardman, of Bangaroo.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ...	Pansy 4th (imp.).	Coff's Harbour ...	20 June, '11.
" ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
" ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
Guernsey ...	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Trevallyn... ...	20 Sept., '11.
" ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	....	10 Oct., '11.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.) ...	....	3 Oct., '11.
" ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Casino	21 June, '11.
" ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Wollongbar Farm	*
" ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A.College, Richmond	*
" ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Berry Farm ...	*
" ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 July, '12.
Ayrshire ...	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
" ...	Royal Prince ..	Curly Prince ..	Rosie 5th ...	Grafton Farm ...	*
" ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
" ...	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ...	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 3rd April, 1911.

BULLS FOR SALE

AT ROYAL AGRICULTURAL SHOW.

FROM BERRY STATE STUD FARM.

AYRSHIRES.—Sandy: sire, Auchenbrain Spicy Jock (imp.); dam, Rose Flower; calved 8th April, 1909; colour, brown and white. Price, **£25.**

Rose Flower is from Roseberry, by Daniel of Auchenbrain (imp.). Roseberry from Roseleaf of Barcheskie (imp.), by Mischiefmaker (imp.).

Scotch Mixture: sire, Auchenbrain Spicy Jock (imp.); dam, Leaf Bud; calved 1st December, 1909; colour, white and brown. Price, **£30.**

Leaf Bud is by Prince Emerald (imp.) from Roseberry, *and is a great dairy cow.*

GUERNSEY.—Crown Prince: sire, Calm Prince; dam, Rose Petersen; calved 8th July, 1910; colour, lemon and white. Price, **£45.**

Rose Petersen is by Peter (imp.) from Rose Petal; Calm Prince is by Rose Prince (imp.) from Gentle.

JERSEYS.—Best Man: sire, Melbourne (imp.); dam, Lady Tidy III (imp.); calved 5th December, 1908; colour, whole. Price, **£100.**

Melbourne (imp.) is by Woolloomooloo (5447) from Harebell XIII.

Jack o' Lantern: sire, Sir Jack; dam, Egyptian Belle; calved 15th May, 1910; colour, fawn and white on flank. Price, **£25.**

Egyptian Belle is by Tidy Punch from Egyptian Princess (imp.); Tidy Punch is by Melbourne Punch from Lady Tidy III (imp.); Melbourne Punch is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Jack brought 170 guineas at auction at last Royal Show.

SHORTHORNS.—Royal Pansy: sire, Royal Hampton X (imp); dam, Australian Pansy; calved 8th December, 1909; colour, red roan. Price, **£50.**

Australian Pansy is by Airy Knight II from Pansy IV (imp.).

Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910 colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

FROM HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRES.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

Emerald's Mischief: sire, Prince Emerald (imp.): dam, Miss Prim, by Mischiefmaker of Barcheskie (imp.), from Primrose of Barcheskie (imp.), by Royal Stuart of Glenbuck, from Lindsay VII of Barcheskie; calved 4th August, 1903; colour, white and red. Price, **£25.**

Milford Haven: sire, Prince Milford; dam, Alexandrina IX (imp.); calved 1st May, 1910; colour, fawn and white. Price, **£35.**

Prince Milford is by Rose Prince (imp.) from Flaxy (imp.); Alexandrina IX (imp.) is by Pomegranate (1510) from Alexandrina II (3220).

BULLS FOR SALE, NOT EXHIBITED AT ROYAL SHOW.

WOLLONGBAR EXPERIMENT FARM.

AYRSHIRE.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS FOR SALE.

GRAFTON EXPERIMENT FARM.

Name.	Dam.	Sire.	Date of Birth.	Price.
				£
Milkmaid ...	Dairymaid II ...	His Worship ...	6 July, 1905 ...	25
My Love	Her Loveliness ...	The Judge	19 March, 1904 ...	25

H. C. L. ANDERSON,
Under Secretary.

Barley Sprouts.

A sample of barley sprouts was analysed for a farmer by the Chemist of this Department a little while ago, and proved to be a very nitrogenous concentrated foodstuff—much more nitrogenous than wheat or oats, or even pollard, bran, or lucerne hay. The albuminoid ratio was also much narrower, the only fodder approaching it in this respect being lucerne hay. It contained less fibre than lucerne hay; and its value should be about midway between that fodder and bran and pollard—say about £3 10s. per ton. It contains much more fibre than bran or pollard, and much less fat; and it would be necessary to add more fatty fodder, such as oil-cake, in compounding a ration.

The following are the figures obtained:—

Barley Sprouts.

	per cent.
Moisture	11·42
Ash	5·37
Ether extract (fat, &c.)	0·21
Fibre	14·61
Albuminoids	21·71
Carbohydrates	46·68
	100·00

Nutritive value ...	68·9
Albuminoid ratio ...	1 : 2·2

Barley sprouts are largely used for feeding in Europe and America.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Luddenham A. and H. Society	F. Shawe	April 4, 5
Cooma P. and A. Association	C. J. Walmsley ...	,, 5, 6
Dorrigo A. Society	F. T. Stennett ...	,, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 5, 6, 7
Royal A. Society of N.S.W. (Sydney)...	H. M. Somer ...	,, 11–19
Corowa P., A., and H. Society (Horticultural Show)	J. D. Fraser ...	,, 12
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 12, 13
Batlow A. Society	G. F. Briggs ...	,, 19, 20
Bathurst A., H., and P. Association	A. H. Newsham...	,, 26, 27, 28
Hunter River A. and H. Association (West Maitland)	E. H. Fountain ...	,, 26–29
Richmond River A., P., and H. Society (Casino) ...	D. S. Rayner ...	May 3, 4
Orange A. and P. Association	W. Tanner ...	,, 3, 4, 5
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 4, 5, 6
Dubbo P., A., and H. Association	F. Weston ...	,, 10, 11
Dungog A. and H. Association	C. E. Grant ...	,, 10, 11
Coonamble P. and A. Association	J. M. Rees ...	,, 17, 18
Walgett P. and A. Association...	S. E. Johnston ...	,, 17, 18
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 24, 25
Brewarrina P. and A. Association	H. L. Cathie ...	June 7, 8
Hay P. and A. Association	G. S. Camden ...	July 11, 12
Deniliquin P. and A. Society	L. Harrison ...	,, 20, 21
Narrandera P. and A. Association	W. T. Lynch ...	Aug. 2, 3
Hillston P. and A. Association	S. I. Gordon ...	,, 3
National A. and I. Association, Brisbane, Queensland	C. A. Arvier ...	,, 7–12
Bogan Gate P. and A. Association	B. M. Lowing ...	,, 9
Trundle P. and A. Association	L. Todd	,, 10, 11
Corowa P., A., and H. Society (Annual Show) ...	J. D. Fraser ...	,, 15, 16
Forbes P., A., and H. Association	J. H. Bates ...	,, 16, 17
Gunnedah P., A., and H. Association	M. C. Tweedie ...	,, 22, 23, 24
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	,, 22, 23, 24
Parkes P., A., and H. Association	G. W. Seaborn ...	,, 23, 24
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Wellington P., A., and H. Society	A. E. Rotton ...	,, 29, 30, 31
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Ariah Park P., A., H., and I. Association	H. C. Dryden ...	,, 12, 13
Cootamundra A., P., H., and I. Association ...	T. Williams ...	,, 12, 13, 14
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Ganmain A. and P. Association	J. H. Ashwood ...	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther...	Oct. 4
Tweed River A. Society (Murwillumbah)	A. E. Budd ...	Nov. 8, 9

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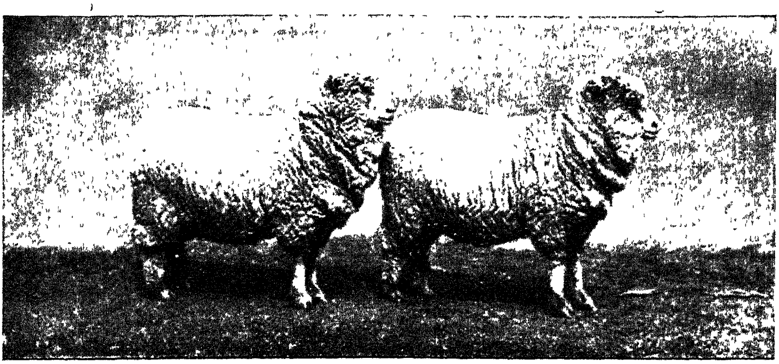
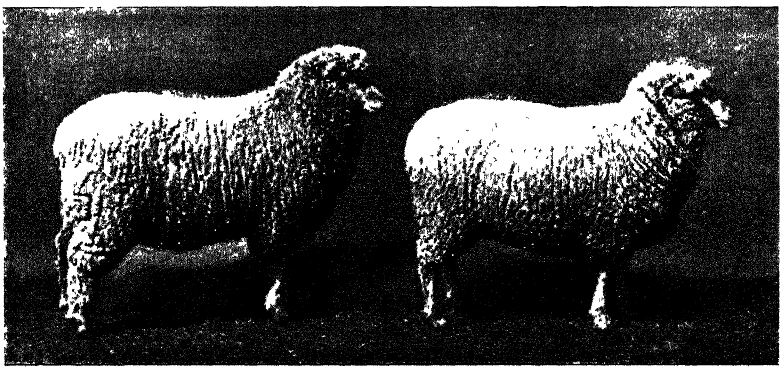


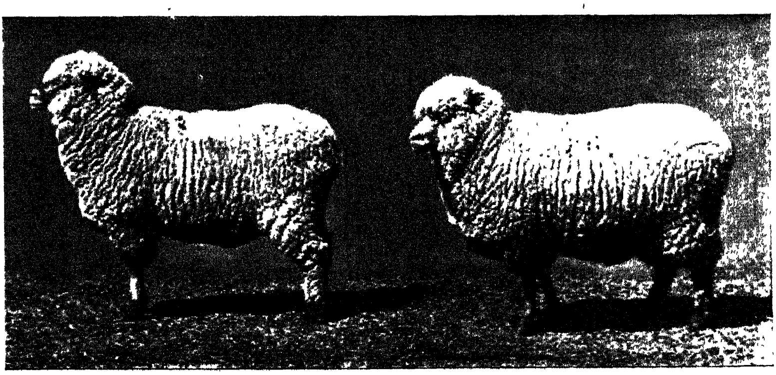
South Down-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 62 lb. 10 oz.
Average live weight of body at seventeen months, 86 lb. 6 oz.



South Down-Lincoln-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 71 lb. 15 oz.
Average live weight of body at seventeen months, 106 lb. 5 oz.



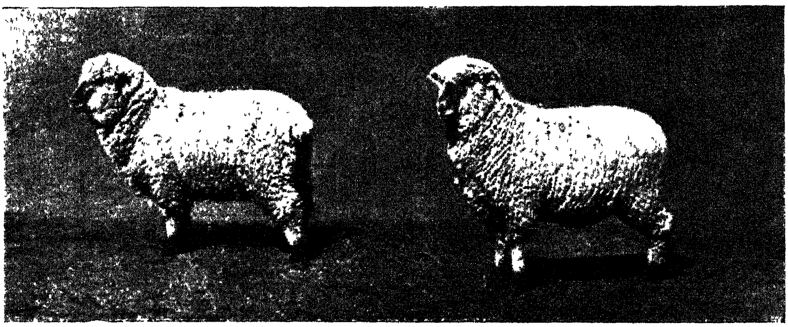
Shropshire-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 64 lb. 7 oz.
Average live weight of body at seventeen months, 90 lb. 2 oz.

CROSS-BRED SHEEP AT WAGGA EXPERIMENT FARM.

Shropshire-Lincoln-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 78 lb. 13 oz.
Average live weight of body at seventeen months, 111 lb. 4 oz.



Hampshire-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 67 lb.
Average live weight of body at seventeen months, 89 lb. 10 oz.

Hampshire-Lincoln-Merino, 2-tooth.

Average live weight of body at sixteen weeks, 73 lb. 3 oz.
Average live weight of body at seventeen months, 114 lb. 6 oz.

CROSS-BRED SHEEP AT WAGGA EXPERIMENT FARM.

VOL. XXII. PART 5. MAY 2, 1911.

Agricultural Gazette of New South Wales.

Sheep and Wool for the Farmers.

THE QUESTION OF MUTTON—THE RAISING OF THE EARLY LAMB.

J. WRENFORD MATHEWS.

OUR attention is still directed to the attempt to evolve, by a system of cross-breeding, the most valuable cross-bred sheep for wool and mutton combined. This effort we have discussed from two different standpoints—the wool clip and the early lamb trade respectively. Concerning the wool element, two prime factors had to be determined—

(a) What breed or breeds mated with the Merino will produce the most serviceable and profitable class of wool?

(b) What type of Merino should be employed?

Both factors were discussed in the December, 1910, number of this *Gazette*, and for all practical purposes identified, the former with the Lincoln, Leicester, Border Leicester, and, under certain conditions, Romney Marsh, the latter with the big-framed Merino.

Secondly, in view of the foreign demand for our mutton, and the great possibilities of future development before this industry, such breeds as will enable us to meet this special demand to greatest advantage must next claim our attention. Long-wool and Short-wool sheep form types primarily quite distinct, and yet capable of combination. This fact makes it possible to meet the demand both for wool and for mutton, and so reap a double profit. The Long-wool's length of staple, weight, purity of colour and character of fibre, make it, when mated with the Merino, capable of producing classes of wool particularly suited to the requirements of the worsted trade, and, in addition, an animal calculated to rank as a good mutton sheep.

In the August, 1910, number of this *Gazette* the different variations of British breeds were discussed with a view to ascertaining, with respect to their typical physical characters, the most useful qualities of each. The basis of classification was, and must necessarily be, the separation of the distinctly wool sheep from the essentially mutton types. From our present point of view, the latter, or Down varieties, are of the greater interest. The Long-wools combine fairly satisfactorily the qualities which enable them to produce both wool and mutton; still, they can never be regarded as the equal, in this respect, of the Down breeds. The compact frame of the Down sheep, their magnificently developed and evenly proportioned bodies, and, moreover, their still further developed early-maturing qualities, make them ideal mutton producers. The difficulty of planning a system of mating consists in deciding how best to preserve these most desirable qualities. Having thus explained at some length the difference between the various breeds of these two groups,

both in respect to their anatomical and physiological, as well as their wool-producing characteristics, we proceed to discuss the merits of the second or Down group.

The subject must therefore be discussed from the following two aspects:—

(a) How is the ideal export lamb to be evolved from the early-maturing mutton breeds at our disposal?

(b) In what manner and degree should we modify this mutton type by the use of wool breeds in order to secure the best possible dual-purpose combination?

Whether the early lamb pure and simple or the dual-purpose sheep be the farmer's objective, he must appreciate and secure certain primary factors of success. His profits may thus come from two distinct sources. But profits will not come from any source, distinct or otherwise, unless an efficient system of mating—definite, well planned, and complete—be followed.

The selection of suitable breeds is an essential condition of success. The time of mating, and resulting time at which the lambs are dropped, must be carefully fixed, with due regard to climate and food supply. Indeed, the importance of fitness of the locality, as regards climate and rainfall, can hardly be over-estimated. A proper and regular system of feeding is another essential, and it must be such as to provide a constant and uniform supply of the feed that will give the ewe a good flow of milk about the time the lambs are dropped. Often no attempt whatever has been made to supply this. It is in this connection that the advantages of mixed farming—lamb-raising in combination with wheat-growing—become most apparent. Fodder crops, grown in rotation with wheat, provide the necessary supply. The need for conducting a mixed-farming business on a properly organised basis is clear from the necessity that lambing should occur just when the fodder crops are sufficiently well grown to enable them to be profitably fed off in small areas in such a way as to secure a continuous supply of succulent feed until the lambs are marketable.

These points are of sufficient importance to be summarised here. They are (1) systematic breeding and mating; (2) co-ordinate with mixed farming; (3) fodder crops; (4) suitability of locality, climate, and rainfall.

Actually, these points are nothing more than what every practical breeder may be expected to know and apply. The fact remains that they are rarely carried out in their entirety. The farmer, although quick to recognise and realise the profits to be derived from the lamb industry, has nevertheless failed to appreciate its special requirements. In the endeavour to produce an early lamb, and to consider both profit and type, he has obviously fallen between two stools. His profits have been secured at the expense of the sheep considered as a wool-bearing animal, and his freely experimental use of all kinds of mutton breeds on the Merino, and nearly everything else, has resulted in the production of flocks of ovine nondescripts.

The Lamb Trade.

To the farmer who includes lamb-raising in his system of mixed farming, the lamb trade is, in all probability, his most profitable market. There is

certainly no branch of the sheep industry in which the stock can be more quickly turned to account, or which will show a greater margin of profit, if properly managed. The cost of keeping the lamb from birth up till a marketable age is exceedingly small. Its main, sometimes almost its only means of subsistence, is its mother's milk. But the ewe must be the right type of mother, and must be adequately fed. A four to five months' lamb, bred on the right lines, and in prime condition, often realises as much as a full-grown sheep will at the age of one and often at two years. Lambs suitable for export, and taken off their mothers at about this age, frequently fetch 12s. per head. Ten shillings is quite a common price for good average specimens. A full grown wether, unless in prime condition, seldom brings more. But in instituting this comparison we must take into account the cost of keeping the older sheep in the meantime, an item which detracts very considerably from its net profit.

In view, therefore, of the profits attached to lamb-raising and the rapidly increasing demand, no sheep-farmer can afford to overlook this branch of the sheep industry. But his desire to profit by this demand should not shut the farmer's eyes to the wool aspect of the question. Moreover, he must consider all the possibilities of his situation. He must estimate the probable conditions under which he will have to work. He must be prepared to hold his own against more favourably situated competitors for the lamb trade. Frequently the business is undertaken under such climatic conditions that it is only fore-doomed to failure.

The Question of Locality.

No hard-and-fast rule can be laid down for the guidance of the intending sheep-farmer in his choice of a suitable locality. But it seems reasonable to suppose that he must confine his attention to the areas well within the agricultural belt.

From time to time attempts have been made to undertake lamb-raising within the areas of limited rainfall, always with somewhat unsatisfactory results. The period or periods of the year at which the rain falls is apparently almost equally as important as the quantity that falls. Even under the most favourable conditions probable, lamb-raising in the drier areas is at best a precarious business.

If the rains are seasonable and sufficient to produce a good growth of natural pasture, the gain is obvious enough, and the farmer, perhaps just settled in the district, and in need of ready cash, finds the business sufficiently remunerative. Such conditions may hold for a year, or even two or three years; but experience has shown that sooner or later the inevitable dry spell intervenes, and his nondescript mutton-bred lambs, unable to make marketable condition, are face to face with conditions under which the Merino or cross-bred wool types would be easily the more profitable. The greater portion of the season's lambs, owing to the scarcity of feed, will probably have been left on his hands; and as these, if bred by Down rams, are distinct neither for wool nor for mutton, he will suddenly find himself in

possession of a very undesirable class of sheep. Then again these western areas are far distant from the central market. The loss of weight during the long train journey, especially during the warmer months, is considerable—often so much as to render the lamb on arrival in Sydney almost unsaleable.

In thus looking at the matter from an economic standpoint, he must remember that there is very little, if any, difference between the value of a full-grown sheep at say one to two years, and that of such a type of lamb as may be marketable at from four to five months. Moreover, the lamb that was unsaleable at five months, and which had to be carried over, can never, if of distinctly Down extraction, be a profitable wool sheep.

The comparatively scanty and inferior fleece, which such an animal would yield at shearing time, would never recompense for its upkeep in the meanwhile. Moreover, the propagation of these partly wool and partly mutton mongrel types is not going to enhance the standard of our wool product. Indeed, the very fact that the breeding of an early lamb has been attempted in these drier areas is attended with grave risk. A system of breeding that can be attempted with every reasonable prospect of success in the more favoured districts of the State is quite another matter, and one attended by the greatest possibilities; but it appears as rash and unscientific tampering with the great Merino flocks of the "outside," which have enabled the areas beyond the belt of moderate rainfall to be turned to profitable account, and flocks which, if once allowed to become degenerated in this way, would, as a type, be irretrievably lost to the wool industry of New South Wales. Beyond the limits of the present agricultural belt has been established a Merino type of which the State may feel justly proud.

However, no matter how far the limits of the agricultural belt may be pushed westward, the Merino will never, as some fear, retire before the advancing wheat-field. These western areas, notwithstanding any possible extension of agriculture within them, have always been, and shall always be, the natural home of the big-framed Merino. This sheep cuts a valuable fleece, and is at the same time a good marketable sheep for mutton; provided always, of course, that the breeder sticks to sound commercial lines, and resists the apparently strong and almost universal tendency to make his run a proving ground for his own fads and fancies. But second only to the conviction that this is the best Merino, yet must come the determination to evolve, if possible, a better Merino still. The great strides that have been witnessed during the last few years make it reasonable to expect that a still more valuable type will be produced. Furthermore, such a type would be even more useful to the farmer of the agricultural areas as a base for the breeding of the ideal sheep from a mixed-farming point of view.

Adaptation of Method to Conditions.

To what extent prevailing conditions will modify his operations the farmer must be prepared to decide for himself, from his own first-hand knowledge of his locality. If his system, as it generally should, be supplemented by the

growth of fodder crops, then the extremely early-maturing Down breeds will undoubtedly be the most profitable, because the ample food supply would enable the whole year's drop to be disposed of.

But when the grower depends solely on natural pasture, lamb-raising cannot be carried on without a larger element of risk. If the season be good, and the pastures lightly stocked, regular and uniform development of the lamb may be expected. A bad season, and the consequent shortage of proper food, results in both the ewe and the lamb suffering a check, and the grower will have on his hands a number of lambs which have been rejected by the buyer. These must either be carried over until the following year and shorn, or disposed of, probably at a great sacrifice, if an opportunity presents itself. No breeder feels that he has been fairly treated when having to submit to the sacrifice of his stock. Notwithstanding the ready sale for prime animals at full market price, poorly fed, low-conditioned, imperfectly bred, badly shaped lambs of inferior quality, usually classed as "third grades," are difficult to quit at almost any price. Where, therefore, no provision other than natural pasture is made for feed, it will pay the grower best to use such breeds as will combine, as far as possible, moderate early maturity with a fairly profitable yet serviceable class of wool. The advantage is obvious, for such lambs as may have to be carried over will, when shorn as grown sheep at the succeeding shearing, cut a fleece at least sufficiently profitable to more than repay the cost of their keep in the meantime.

This dual-purpose strain must be selected from among the Long-wools. The exact breed will, of course, vary with locality and other circumstances. This matter was discussed at length in December *Gazette*. In these types, necessary as they are under our varying seasonal conditions, the ideal has been partly, but only partly, reached.

Neither, broadly speaking, has the most valuable cross-bred wool sheep, nor the best early-maturing strain in the lamb, been attained. The farmer's sheep must be a combination of the wool type and the early-maturing type. To attain the maximum profit, he must aim at evolving a ewe that will yield the most valuable fleece, consistent with the ability to rear the vigorous early-maturing lamb.

The Selection of the Ewe.

How can these qualities be obtained in combination? By a definite system of mating. As already indicated, the first consideration is the selection of the ewe.

Among breeders of all classes of stock it is regarded as an axiom that in the attempt to attain any ideal in breeding, the choice of the sire is an all-important factor of success. This principle is certainly applicable to sheep-breeding. It is also a matter of common knowledge among experienced flock-masters that while the ram may work wonderful changes in the flock, unless his prepotency is reinforced by the selection of suitable ewes, the dominant characteristics of his type are only partly secured.

Here, from the present point of view of our discussion of the subject, two very important points present themselves—the fixing on the ram of the

right breed, and the selection of the most suitable ewe to mate with it and mother the lamb in order to secure early development. The latter is almost as important as the former.

Frequently little or no attention has been paid to this important choice. It has too often been supposed that any class of ewe was good enough to rear a "freezer," just as it was the impression that any type of Merino ewe did for raising cross-bred wool types. The selection of the right type of ewe for the raising of the "freezer" is equally as important as the essential choice of the big-framed Merino for mating with the Long-wool in the evolution of the most valuable cross-bred wool type.

If the production of the ideal early lamb were the sole aim, then the very best choice would undoubtedly be the Down breeds in their pure state. No system of mating can yield a progeny that is any improvement on pure Down strains; but the purchase of pure-bred South Down or Shropshire ewes, not to mention other varieties, would be too expensive an item for the average farmer, unless the increased value of the lamb were sufficient to make good the additional outlay. Further, since the Down breeds are unprofitable wool sheep, he would, by their use in a pure state, largely decrease the value of his clip, and thus defeat part of the object in view.

What type of ewe, then, should he secure in order to obtain this profitable fleece? His ewe must be either the Merino or a derived cross-bred type.

The Merino Unsuitable.

The Merino pure and simple is by nature unfitted to be the foundation of the ideal mutton strain. In conformation it is diametrically opposed to this type. Its frame is small; its body is narrow and sparsely covered with flesh; its legs are long and slender. Moreover, it is a very slow maturer. It has been a very common practice to place Down rams on Merino ewes—with no regard for the type of Merino concerned—with the intention of raising the most profitable lamb. Anyone who cares to compare these breeds cannot fail to realise how distinct they are in type and conformation, or to satisfy himself how entirely such methods are foreign to, and calculated to defeat, the objects such breeders claim to be keeping in view.

Then again, the Merino ewe in the pure state, though valuable for her wool, is unsatisfactory as a mother. She yields a relatively small quantity of milk as compared with the bigger-bodied Longwool-Merino cross-bred. Moreover, the raising of her natural progeny, a pure Merino lamb, is a very different task to that of mothering the bigger-bodied and more vigorous lamb that would be dropped to a Down sire. If a Merino ewe does raise such a cross-bred lamb, it is at the expense of a strain on her system generally; and especially from our present point of view, on her wool-producing powers; so that she can only yield a much lighter and consequently much less valuable fleece. If compelled to undertake this unfair task, the strain is such that after a couple of seasons her constitution is wrecked and she can be of no further use as a mother.

In the search for the ideal mother—a wool type—we must dismiss the Merino as such from our consideration. We must look to such breeds or crosses as will, while producing a profitable fleece, also combine good milk-production with well proportioned and uniform body development.

In the preceding article of this series, published in the December *Gazette*, the various cross-bred types derived from the Merino were discussed at some length. The Lincoln-Merino, Leicester-Merino, and Border Leicester-Merino were enumerated as the only combinations that called for special discussion from the point of view of these papers—that of the farmer's or dual-purpose sheep. The ewes of those crosses were described as possessing practically all the qualities most desirable for the establishment and maintenance of dual-purpose breeding. Briefly, the special characteristics of those breeds are indicated by the statement that the Lincoln is the slowest maturer and heaviest wool-producer, as contrasted with the somewhat lighter-fleeced but superior-bodied and earlier-maturing Leicester, and the finer-woolled but hardier and still earlier-maturing Border Leicester. The Merino. distinctly a wool-producing type, largely modifies all these characteristics when the Long-wools are brought into combination with it; but the Merino characteristics are in turn modified to a somewhat similar degree. A Down ram mated with this Longwool-Merino ewe will furnish the required dual-purpose combination. Thus the Merino becomes a means for the utilisation of the qualities of the Long-wools, by becoming the medium by means of which such qualities can be transferred to the produce of Down sires. This marks the application of a principle new in sheep-breeding systems—systems known only to countries situated far beyond the original homes of these breeds.

In consequence, therefore, of the earlier or later maturity of the Lincoln, Leicester, and Border Leicester, and their modification by the Merino factor in the cross, we must ascertain what influence (if any) these characteristics exert upon the subsequent development of the lamb after the early-maturing Down varieties have been used on these crosses. Thus we have to investigate, not for one year, but over an extended period, the principles which regulate wool production, milk production, and earliness of maturity in the different Long-wool breeds which have been mated with the Merino, before the most valuable cross-bred wool type or the ideal class of early lamb can be determined.

Reference has previously been made to the series of experiments now in progress at the various State Experiment Farms. The lines of investigation have been so devised as to furnish first-hand information on every possible point that is reasonably relevant to the important issues involved, and to enable us to place on record the fullest particulars for the guidance of those sheepbreeders who aim at combining farming with the raising of the dual-purpose cross-bred sheep. The appended table shows the actual operations proposed at one of the Farms, and will give an idea of the scope of the present investigations. The operations at the other Farms are similar.

The relative merits of the different Down breeds will be the subject for discussion in our next article.

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The last edition of the "Farmers and Fruit-growers' Guide" was issued by direction of the Department of Agriculture in 1904. That book has been out of print for some time, and repeated requests for a new edition have been received by the Department from agriculturists throughout the State, particularly from the large number of people who have lately responded to the call of the soil and taken up farming pursuits. Mr. W. H. Clarke, when Editor of the *Agricultural Gazette*, undertook the work of compiling a new edition, but it was found that such knowledge has been gained during the past few years respecting the resources of the State, new methods of tillage, new varieties of crops and fruits, and new methods of breeding and handling stock, that it would now be impossible to include within one book of convenient size even an outline of the principles of farming and fruit-growing as practised in New South Wales. It was, therefore, necessary to divide the subject, and leave our great and expanding fruit industry for a separate publication. That this step was justified is shown by the fact that the "Farmers' Handbook," condensed as it is, contains 748 pages, in lieu of the 576 included in the last edition of the combined "Guide."

The Handbook is divided into fifteen sections—Farm Lands of New South Wales; The Chemistry of the Soil; The Cultivation of the Soil; The Farm Holding; Agricultural Implements; Cereals; Root Crops; Leguminous Crops; Miscellaneous Crops; Saltbushes and Edible Native Trees; Silos and Silage; Fodders and Feedstuffs; The Farmers' Weeds; Live Stock; and Farmers' Calendar. These are subdivided as required, the aim being to give a comprehensive outline of principles known to present agricultural science and practice in relation to the various methods of utilising the resources of the soil under our extremely divergent conditions.

As in the case of the old "Guide," the main source of information has been the articles published in the *Agricultural Gazette of New South Wales*. The result is, that the book contains the best advice which can be given from experiments conducted at the Experiment Farms throughout the State during the past twenty years; from tests made and knowledge gained in the scientific laboratories of the Department; from the scientific and practical training of experts; and from the experience of successful agriculturists as related by themselves or by Departmental officers.

But as the work of compilation proceeded, it was found that several subjects have not been comprehensively dealt with in the *Gazette* during recent years. To merely give the latest developments in these cases would not meet the requirements of the book as a guide to beginners. Several

chapters have, therefore, been entirely rewritten by experts, and contain information, chiefly of an elementary character, which has not previously been published by the Department.

The practical farmer, who can seldom be acquainted with the methods of handling every crop and every kind of stock in the State, will find this a useful book of reference. The students in our agricultural colleges and schools will use it as a text-book. To those who, attracted by the alluring prospects of agriculture in a young country, or from motives of patriotic sentiment, abandon other occupations in order to begin the tilling of the soil, the "Farmers' Handbook" will give a knowledge of principles which cannot be gained in such a convenient form from any other source.

Published by the Government Printer, Sydney. Price: Paper, 3s. 6d.; by post, 4s. 6d. Cloth, 5s.; by post, 6s. 2d.

WINTER SCHOOL FOR FARMERS AT THE HAWKESBURY AGRICULTURAL COLLEGE.

THE short courses provided by the Department of Agriculture at the Hawkesbury Agricultural College, Richmond, during the students' winter vacation, have now become an established fixture. These are provided for go-ahead farmers at a slack time of the year, when they can best get away from their farms for a few weeks for the purpose of gaining valuable instruction at one of the foremost agricultural institutions in the world. The course lasts four weeks, commencing Monday, 19th June, and terminating Saturday, 15th July, 1911. Instruction is imparted in agriculture and dairying, live stock, botany, chemistry, book-keeping, elementary surveying for the farm, building construction, poultry, engineering, blacksmithing, saddlery, gardening, fencing, veterinary science, sheep and wool for the farmer, &c. Applicants are allowed to make a selection from these subjects, as it is not possible to "take" them all in the time available.

Farmers who have attended these schools speak very highly both of the officials and of the class of instruction imparted.

The Department charges only £2 2s. for the four weeks, this sum covering board and lodging at the College. Applicants travelling over 25 miles by rail also get reduced fares, at the rate of single fare for the double journey, a reduction of nearly 50 per cent.

The number that can be accommodated is, of course, somewhat limited, namely, 100, and hence it is advisable to make early application. Syllabus and application form are obtainable from the Under Secretary, Department of Agriculture, Sydney. The lists are to close on 31st May.

Farmers and their sons, and other rural workers over 16 years of age, are eligible for admission, but ex-students of the College are not eligible, owing to the limited accommodation.

Grain Sorghum.

In this State, sorghum is generally grown for green feed or silage in districts which are too dry for maize, but in Western America selected varieties are being grown for grain, the grain being used as stock feed. It is proved by analyses to be about equal to corn, except that it is a little richer in protein and a little poorer in fat and fibre.

The varieties most generally grown for grain, according to Bulletin No. 203 of the United States Bureau of Plant Industry, are Milo, Durra, Kaffir, and Kowliang, the yield of seed ranging from 10 to 20 bushels per acre. The varieties are being considerably improved by selection of seed, the objects aimed at being drought-resistance, earliness, dwarf stature, productiveness, and adaptability to machine handling. Dwarf Milo can be harvested with an ordinary grain header. Erect heads are an important requirement.

There are 1,250,000 acres in Kansas and Oklahoma devoted to seed sorghum, and probably an equal area in Texas. In the drier districts the crop is displacing corn. Grain sorghum may soon find a place in our dry districts, as it pays us also to "market our crops upon the hoof."

Digestibility of Meat.

The popular opinion that meat varies in digestibility—for instance, that pork is less digestible than beef or mutton—would appear to be incorrect, according to Farmers' Bulletin No. 391 of the United States Department of Agriculture, "Economical use of Meat in the Home." Experiments have shown that over 95 per cent. of the protein and fat of all kinds and cuts of meat is digested under normal conditions, and there are no marked differences in the thoroughness with which different sorts are digested. All meat is very digestible food. Utilising the cheaper cuts of meat in palatable dishes is, therefore, a sound practice, and the Bulletin gives a number of suggestions to overcome toughness and lack of flavour. Prolonged cooking at a low heat will make meat tender without hardening the fibres. Pounding meat before cooking is liable to drive out the juices, and with them the flavour. A good way to escape this difficulty is to pound flour into the meat; this catches and retains the juices. In prolonged cooking, the flavour-giving extractives may be retained by first searing the exterior of the meat, and thus preventing the escape of the juices; or by letting them escape and serving the gravy with the meat. A number of recipes are given to illustrate these principles.

This Bulletin appears to be very popular in the United States. After 900,000 copies had been distributed the free supply gave out; and when the last Annual Report was written, 47,148 more copies had been sold. We do not know if it is now on sale; but if it is still available, it may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., U.S.A.; price, 6 cents. (3d.).

Superphosphate for Wheat.

THE following table shows the quantities of artificial manures (superphosphates, &c.) used in New South Wales and South Australia for the years 1907 and 1908:—

	1907.		1908.	
	cwt.	acres.	cwt.	acres.
New South Wales...	267,120	409,259	310,899	491,216
South Australia	1,200,160	1,555,153	1,296,840	1,693,670

The natural manures (stableyard, &c.) used for the same years were:—

	1907.		1908.	
	loads.	acres.	loads.	acres.
New South Wales	144,021	14,419	216,078	18,046
South Australia	124,092	18,708	120,648	18,718

These figures show that we use more farmyard manure than the South Australians (chiefly in the County of Cumberland and on the South Coast); but when we examine the figures for artificial fertilisers, we find South Australia manuring four times the area, with four times the amount of fertiliser. The factor which causes the extraordinary difference is, of course, the use of superphosphate in growing wheat.

In the next table will be found the average yields of wheat in the two States from 1900 to 1908, omitting the drought year, 1902, when the averages in both States were extremely low:—

	1900.	1901.	1903.	1904.	1905.	1906.	1907.	1908.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
New South Wales	10·6	10·6	17·5	9·3	10·7	11·7	6·6	11·1
South Australia	7·15	5·66	8·29	6·96	11·78	10·36	11·06	11·46

In New South Wales, the average for the first four years was 11·94, and for the last four, 10·19. In South Australia the first four years averaged 7·05, and the last four, 11·17. In other words, whilst our average decreased 1¾ bushels, that of South Australia increased over 4 bushels.

The areas sown were very similar, as the following comparison shows :—

	acres.	acres.	acres.
New South Wales . ..	1,530,609	1,939.447	1,394,056
South Australia	1,574,017	1,710,286	1,692,131

It will not be claimed that this extraordinary improvement in South Australian averages is entirely due to the use of superphosphate, as the rainfall has, undoubtedly, had some influence. The rainfall at Adelaide for the first four years totalled 85·47 inches, and for the last four, 91·16. At Cowra, in the heart of our wheat country, the figures are 93 and 81 inches respectively.

If we take the Cowra rainfalls—assuming that they fairly represent New South Wales—and do a little proportion sum, we find that the four years' average of 11·94 bushels from 1900 to 1904 should be 10·39 bushels from 1905 to 1908, if wheat yield depends exactly upon the rainfall. As the actual figure is 10·19, we have a pretty fair basis of comparison. Applying it to South Australia, and taking Adelaide rainfall as representing that State, we find that the 7·05 bushels from 1900 to 1904 should have been 7·51 from 1905 to 1908. Instead of that modest figure, it was 11·17. So there is a difference, for which the rainfall cannot account, of 3·66 bushels per acre.

South Australian cultivation methods have improved much during the last few years; but so, let us hope, have those of New South Wales. Perhaps we cannot say that the whole of that 3·66 bushels is due to superphosphate, but we can certainly affirm that the great bulk of it must be. During both periods under comparison, New South Wales wheat-fields were, practically, unmanured. During the latter period, almost the whole area under wheat in South Australia received an application of superphosphate.

From time to time results from Experiment Farms in the wheat belt of this State have been published; returns from Farmers' Experiment plots have been given; and farmers have related their experience. The general effect of all these tests is that in this State, on most wheat soils, where wheat is grown continuously, an application of superphosphate at the rate of about 56 lb. per acre results in an increased yield about equal to that received in South Australia. It would work out at between 3 and 4 bushels per acre. That being so, it seems good practice for all farmers who grow wheat continuously to use the manure, until they know for a positive fact that it does not pay.

There are, undoubtedly, cases in which it will not pay. If the ground is fresh and fertile, with a sufficient supply of *available* plant food, it will, probably, derive no benefit from manure. If fertility is maintained by fallowing, or alternating wheat with a sheep crop, this will supply part, or even the whole, of the benefit which would be derived from superphosphate. Results of extensive experiments at Cowra, Bathurst, and Wagga Farms

bearing out these points will be published shortly. But all the evidence points to the fact that every farmer who grows wheat continuously should use superphosphate, unless he has absolute proof that it will not pay for the present. If he keeps on growing wheat continuously, he *must* use manure or his yields will go down.

Worms in Sheep.

Owing to the excessively wet nature of the present season, many inquiries have been received by the Stock Branch, Department of Agriculture, as to the best methods of combating these pests. It is therefore considered desirable to publish a short note recapitulating the recommendations of the Veterinary Staff.

In all cases, no matter what worms are present, the sheep require salt, and a lick composed of sulphate of iron 1 part, bone-meal 5 parts, and Liverpool salt 30 parts; or one of sulphate of iron 1 part, sulphur 2 parts, and Liverpool salt 30 parts, should be provided. In addition, if the sheep are affected with stomach or intestinal worms, the following drench should be given:—

Take 1 oz. of arsenic, 2 oz. of washing soda, and boil in about a quart of water until dissolved and clear; strain the liquid of any sediment that may be deposited; then add sufficient water to make 3 gallons of liquid.

The dose of this mixture for a full-grown sheep is 2 oz.; for a nine months' sheep, $1\frac{1}{2}$ oz.; and for a six months' lamb, 1 oz.

This drench should be repeated in two or three weeks, and again in a month's time from the second drench. No ill effects will result so long as the drench has been prepared as above, and is carefully administered.

For lung worms, fumigation offers the best means of combating the disease in a small flock. The sheep are placed in tents, or some small air-tight shed, and a pan of sulphur lighted. The sheep may be kept in the sulphur fumes for fifteen or twenty minutes, but should be carefully watched and liberated on the least sign of suffocation.

Lung worm in large flocks is very difficult to deal with, but the general measures given below will be found to counteract the ill effects of the parasite:—

In all cases of parasitic infestation, it will be found that if good food is supplied, and more especially a certain percentage of dry feed, although this does not destroy the parasites yet it enables the sheep to keep in good condition in spite of them. A supply of good feed should, if possible, always be combined with other measures.

Sheep should be kept as much as possible away from low-lying swampy ground, and such ground may profitably be drained.

Burning off of the pastures as occasion permits, is bound to destroy a certain number of eggs and embryos in badly-infested country.

For fuller information on these matters, see the *Agricultural Gazette* for October, 1900, and April, 1909.

Behaviour of Australian Varieties of Wheat when grown in England.

At the recent Sydney meeting of the Australasian Association for the Advancement of Science, a paper was read from Mr. A. E. Humphries, of Weybridge, England, President of the National Association of English and Irish Millers, on the behaviour of some of the new Australian varieties of wheat when grown under English conditions.

On behalf of the Home Grown Wheat Committee of the National Association, Mr. Humphries tested a large number of colonial and foreign wheats in the field, to ascertain especially:—

(1) Whether any were suitable for distribution to British and Irish farmers without selection or hybridisation;

(2) Whether among the commercial varieties, any would be found which would be superior or equal in yield of grain and straw, and superior as regards quality, to those now generally grown by British farmers;

(3) Whether any possessed such characteristics as would render them valuable as parents in Professor Biffen's work of hybridisation and selection along Mendelian lines.

Late in 1907 several Australian varieties were received by Mr. A. D. Hall, Director of Rothamsted Experiment Station, with the request that they should be tested. These were included with the other varieties tested by Mr. Humphries. The varieties were Comeback, Federation, Gluyas, Marshall's No. 3, Nhill, and Yandilla King. These were received too late for sowing under favourable conditions in the English autumn of 1907, and were sown in February, 1908.

The weather during the growth of the crops was on the whole unfavourable. March was cold and wet, and the six varieties did not show above ground until 4th April. April was wetter than usual, with snowstorms. May was a favourable month. June was a dry month, and the general conditions were favourable for wheat; nevertheless, rust showed on all the wheats.

In the middle of July it was very wet and miserable, and this played havoc with the Australian varieties. Nhill and Yandilla were already too bad to be much spoilt; but during one week Federation was ruined, though the others managed to survive and yield a small amount of grain. All the six Australian varieties are marked bad for rustiness and mildew, Federation very bad.

The yield of grain from Nhill, Yandilla King, and Federation was practically nil; from Marshall's No. 3, very small; and from Comeback and Gluyas, small.

It was remarked that the Australian varieties came into ear more rapidly than the English ones. Flour made from Comeback behaved well in the bakehouse.

In the next year the three varieties Comeback, Gluyas, and Marshall's No. 3, were tried again; together with Bobs, Florence, and Jonathan, seed of which had also been received for testing. The seed was sown in October, 1908. The month of June was wet, and the temperature low for the time of year. Rust was prevalent; Jonathan, Florence, Bobs, and Gluyas were very rusty; Comeback very poor, but less rusty. Marshall's No. 3 was the least bad, and not nearly so rusty as the others.

Marshall's No. 3 yielded a small crop; the other five were practically killed by rust.

Some samples of Alpha and Huguenot from Western Australia, and also a second sample of Gluyas, were sown in the spring. In July, Alpha was valueless on account of rust, and was an absolute failure, as the straw died when it should have ripened. Huguenot suffered from mould as well as rust.

Marshall's No. 3 and the spring-sown Gluyas were the least bad, but in no variety was there any point of value for English conditions.

This paper is of special interest in showing how some of the varieties of wheat created by the late William Farrer, and which have established themselves as favourites with local farmers on account of their good field qualities, behave when grown under the conditions which obtain in England. The story, as the author says, is a dismal one, for none of the wheats tried gave satisfactory results, and in nearly all cases they were absolute failures. Liability to rust under English climatic conditions was the principal cause of their failure. Wet and gloomy weather prevailed in June and July, and they were practically all destroyed by rust.

Such a result need in no way discourage those who are engaged in the improvement of wheat for Australian conditions. On the contrary, it should act as an incentive to further efforts, proving, as it does, that we are ourselves not likely to obtain from foreign wheats the particular qualities which will render them serviceable to us, and that each country must evolve the varieties suitable to its own conditions.

Treatment of Bites by Poisonous Spiders.

The Department of Public Health was recently asked by the manager of the Yanco Experiment Farm for instructions as to treatment of bites by the small red-spotted spider. The reply is, that the first-aid treatment of bites by poisonous spiders should be on similar lines to that for snake-bite, with which most of our readers are acquainted. The ligatures should be applied in the same way, and the part cut into by a small incision, and a weak solution of ammonia should be applied. If ammonia solution is not available, a strong solution of potassium permanganate (or Condy's fluid) should be used in its stead.

Rhodes Grass *v.* Paspalum.

In response to the invitation in March *Gazette*, page 238, we have received several letters from farmers who have tried these two grasses.

Mr. William Manyweathers, Dunoon, via Lismore, says:—

Two years ago I sowed Rhodes and Paspalum together in the proportion of about (not exactly) one Rhodes and ten Paspalum on newly burned scrub land. The Rhodes came much more quickly, and considerably thicker. The inkweed (so common in this part) also came very thickly, and before it could be dealt with, much of each kind of grass was smothered. Where the land was properly cleared, both grew equally well, but where the weeds got the advantage, the Rhodes struggled through, seeded thickly, and in many places I cut the seed, which waved beautifully over the top of thick inkweed 4 to 6 feet high, and with this I sowed the bare patches. The Paspalum was not nearly so vigorous.

This year I have had 30 acres of scrub fired. On this I have planted 15 acres of Rhodes and 15 of Paspalum. On the one half I sowed 80 lb. of Rhodes and on the other about 400 lb. of Paspalum. The seed was sown about the middle of December, 1910. The Rhodes came up much quicker than the Paspalum, but is only just about as thick (18th March). The Rhodes varies in height from 6 inches to 48 inches; the Paspalum from 6 inches to 18 inches, both according to position on high or low land. On the whole, the Rhodes half is 50 per cent. better than the Paspalum. As to its palatability, cattle like it equally well, but horses much prefer it.

I consider, from experience, that it is a splendid grass to have in Paspalum country, as cattle greatly appreciate a change. Next, it is surer in germinating and quicker in coming, which means a lot to the planter. Finally, it will hold its own with weeds better than any other grass I know of.

From Mr. S. G. Rodgers, "Hazeldene," Central Raleigh, on the Bellingen, we have received the following:—

On 28th November, 1910, I planted about 35 acres with Rhodes grass Four days from the day I started planting the grass began to come, and to-day (27th March, 1911) it is 9 feet high. At the same time I shut up a Paspalum paddock, which has only grown 2 feet, but the actual feed in that paddock is only 9 inches—the rest is a coarse stalk which the cattle will not eat. With Rhodes grass it is all feed, and the cattle eat every particle, even the seed, and I find the cattle are spreading it all through the Paspalum. I am hoping that in time it will eat the Paspalum out.

Rhodes grass may appear, and it certainly feels, rather coarse; but anyone thinking of trying it need not worry about that, for I find the cattle prefer it to anything else, even green corn.

Another good point about it is that it makes splendid hay. Recently I threw out a bag-full of tops after shaking the seed, and the cows eat it readily. When that was finished I threw out some more, and the cows would not leave the barn for hours. Since then I cut some grass and made hay, and I find it hard to beat.

The cost of the seed may frighten a lot of people, but it is far cheaper to grass land with Rhodes than with Paspalum. I got a good sowing from 2lb. to the acre, and paid 2s. 6d. per lb., or 5s. per acre. To grass your land with Paspalum you have to use 15 lb., which costs about 8d. per lb., or 10s. per acre. I may state that 1 lb. of Rhodes seed will just fill a 2-gallon bucket.

There is also a fair amount to be made out of seed, as it bears a heavy crop of seed. The seed comes from January up till May. The average amount picked in a day is from 25 to 35 lb.

We have now published comparisons of the two grasses from farmers on the Richmond, Bellingen, and Nambucca Rivers—all favouring Rhodes. This is decidedly against the opinion that Rhodes is a grass for dry districts only. Farmers in other districts are cordially invited to give their *experience*, and it is hoped that any who have tested both grasses, and still hold a lance for old King Paspalum, will favour the Department with the facts. It is the quickest way to get at the truth.

Experiments with Grasses on the South Coast.

R. N. MAKIN, Inspector of Agriculture.

In connection with the experimental work on the South Coast some attention is being paid towards selecting some useful grasses. Winter grasses are most sought after at present by farmers, as in summer time our native grasses are generally a good stand by.

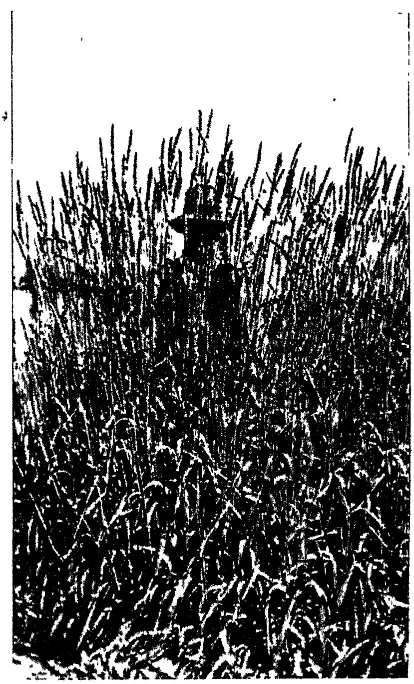
Phalaris commutata at **Kangaroo Valley.**

It is surprising that there is not more *Paspalum dilatatum* grown than is the case. At Milton some very fine paddocks of this grass are to be seen growing on both sandy and good black soil. Some farmers speak very highly of it, but, generally speaking, it is condemned. It must be admitted that it has been tried and failed in some parts, but there are many localities in which it should be tried before condemning it. It certainly does not bear the good name on the South Coast that the North gives it, and is found wanting during the winter months.

Festuca elatior (Tall Fescue Grass) at Kangaroo Valley.

Eragrostis pilosa (Weeping Love Grass) at Kangaroo Valley.

However, another grass of more recent introduction is attracting attention, namely, *Phalaris commutata*. During this season's experiments some small plots, with no special treatment, have done exceedingly well at Pambula and Kangaroo Valley, after being planted only a few months by division of the roots. At Pambula, the grass has grown about 7 ft. high, and at Kangaroo Valley about 5 ft. It is intended to thoroughly test this grass by putting down small paddocks of it in the different districts and turning stock in, as unless it will stand grazing it is of little practical use. A few rows of it among some other grasess, on the Milton plots, stood grazing well, and in fact, appeared to benefit by stocking, but as there were only some few dozen plants, very little information could be gathered from them. However, it formed very sweet succulent feed, and was relished by the stock. It is a great grower during the cold months. During a visit I paid to Bombala in the winter months I saw a small plot making splendid growth.



Phalaris commutata at **Bombala.**

Another strong-growing winter grass that is doing well is *Festuca elatior*, or Tall Fescue. This grass is grown to some extent in New Zealand. It gets a very firm root-hold, but to my mind is not such a desirable grass as *Phalaris commutata*. There is about a quarter of an acre of it on the Milton plots, and stock were turned on it, but only ate it down roughly. It soon ran up to seed when the stock were taken off in the spring. It is also doing well at Pambula and Kangaroo Valley.

Some of the native grasses are doing well at Kangaroo Valley. *Eragrostis pilosa* is a rapid grower, and stands cold weather well. Judging by the seedlings coming up it should spread quickly. So far no grazing experiments have been tried. The same remarks apply to *Eragrostis curvula*. Some roots of *Pollinia fulva* and *Andropogon contortus* were also planted, but, unfortunately, only a few struck. These will go towards forming larger plots to be sown shortly.

Pera Bore.

Experiments with Grasses and Fodders.

W. J. ALLEN.

In December, 1909, reference was made to experiments which were being carried out at Pera Bore Experiment Farm with different grasses, some of these being planted on dry areas, whilst others were planted with a view to future irrigation.

The season proved a good one for the establishment of grass plots, as fairly good rains were recorded last winter and during the late summer.

The Rhodes grass roots which were planted gave much better results than where seeds were sown; as, while about 60 per cent. of the roots started, only a comparatively small number of the seeds germinated. Some of the latter, however, made quite as strong growth as the rooted plants; in fact, any of those which started early in the lighter soil, were equally as strong by the fall as rooted plants growing in similar soil. Unfortunately, the plants grown from seeds did not come up well enough to nearly cover the ground.

Fig. 1.—Rhodes Grass at Pera Experiment Farm.

Fig. 1 shows the plot of Rhodes grass which was planted with roots about 4 feet apart, and which made a good growth under natural conditions. Both strong and weak roots were experimented with, and the strong gave much

Fig. 2.—Weeping Love Grass (*Eragrostis pilosa*) at Pera Experiment Farm.

Fig. 3.—*Paspalum dilatatum* at Pera Experiment Farm.

better results than the latter. By strong and weak roots is meant larger and smaller portions of roots. On the adjoining plot, where the Rhodes grass-seed was sown on well-prepared soil, the stand was not so good as where roots were planted.

Fig. 2.—*Eragrostis pilosa*, or Weeping Love Grass, has (under irrigation) made the strongest growth of any of the grasses. It grows quickly, either seeds or roots taking readily where grown under irrigation. We have not yet tested this grass under natural conditions, but we are preparing some land for this year, and have sown a small plot last year as a test. The seed was put in during September, and a report will shortly be available. This grass makes good feed, either for grazing purposes or when cut for hay; the stock eat it readily.

Fig. 3—*Paspalum dilatatum.*—This grass grows well under irrigation, but fails utterly when growing under natural conditions. As it spreads rather than growing upright, it is not considered that it would be of much value except for grazing purposes.

It looks as though Rhodes, *Eragrostis pilosa*, and *Paspalum dilatatum*, will be the more profitable grasses for this district.

Fig. 4—*Blue Grass.*—The roots of this grass did not take well, but those which grew made good strong plants. It is questionable whether it will ever prove profitable to grow.

Fig. 5—*Mitchell Grass.*—This grass did not make a good growth during last season, notwithstanding the fact that it received every attention in the way of irrigation and cultivation.

Phalaris commutata did not make a very strong growth during summer, but improved during the winter.

Phalaris paradoxa and *Phalaris minor* are being experimented with side by side with the above variety. The two latter varieties are supposed to do well in the back country. *P. paradoxa* is sharply distinguished from all other species by the sharp horn on the wing of the outer glumes, and by the deformed and crested sterile spikelets.

Fig. 6—*Lucerne.*—This 5-acre plot was sown in the fall (April) of 1909. It made a fair growth during the winter, but so also did the weeds, mustard, &c., and, consequently, the first cut was of little value for feed. Subsequent crops, however, came away well, and, although it does not grow very high, it makes very fair hay and good feed.

Fig. 7—*Planter's Friend.*—One of the best sorghums to grow in the back country—crops well and produces a heavy crop of seed.

The galahs took possession of the sorghum when it was ripening, and harvested the seed before it was ripe. As we have very little use for this fodder at Pera, we do not intend growing much of it in future, as we have proved that it can be grown year after year on the same soil without rendering the soil useless, as claimed by some who had grown it at artesian bores.

Fig. 4.—Blue Grass at Pera Experiment Farm.

Fig. 5.—Mitchell Grass at Pera Experiment Farm.

Fig. 6.—Lucerne at Pera Experiment Farm.

John Brown Wheat.—This has been found to be one of our best wheats for the hot dry district, usually beating any other variety by several hundredweight of hay per acre.

Skinless Barley did well last season without any irrigation. It is looking well again this year with only one watering.

Fig. 7.—Planter's Friend Sorghum at Pera Experiment Farm.

SORREL.

SORREL can be eradicated by liming and cultivation. So far the best remedy found is lime. Generally speaking, applications of lime, from 5 cwt. to 10 cwt. per acre, will kill out and keep down sorrel, as well as benefit the soil in other ways.

On no account should the sorrel plants be allowed to seed. Plough and expose the roots to the frosts during winter, then plough in the spring, and sow a strong-growing fodder-plant to smother out the sorrel.

Lime should be applied in the autumn, and crops can be sown on the land from a month to two months after it has been limed.—GEO. VALDER.

Our Experiment Farms.

J. E. O'GRADY.

YANCO.

Manager—F. G. Chomley. *Experimentalist*—G. S. Ridley.
Orchard Foreman—J. M. Arthur.

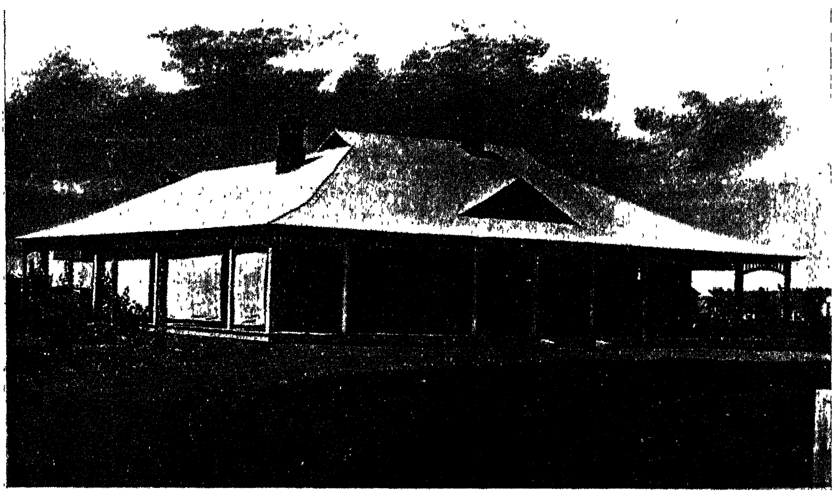
THE geological history of our southern highlands is so ancient that it cannot now be fully traced, but a few facts are well known. Burrinjuck (lately known as "Barren Jack") marks the position of an old range to the south-west of Yass, formed by a contraction of the earth's crust throwing up a mass of granite into the sedimentary rocks. When the Murrumbidgee began to flow as a mighty mountain torrent, it carried silt and sand from the highlands to the plains, helping to form the dry yet fertile belt of country which we know as Northern Riverina, until the mountains were so reduced in height as to expose the summits of Burrinjuck. Then the waters, unable to sweep away this great mass of harder material, were compressed within narrow boundaries at the lowest point of the range, and gradually carved a gorge through the hills. As the gorge deepened, the softer rocks to the north-east were slowly carried away by the tumbling waters and emptied out upon the plains, leaving the bed of the river much wider, and forming a natural cavity except for the narrow gorge at its mouth. Now the State Government, realising the value of the waters when united with Riverina soil, has ordered the closing of the gorge, so that the Murrumbidgee may be controlled, its surplus waters poured in gentle, summer streams over the parched, fertile plains, and the demon of drought subdued. Burrinjuck Gorge is being dammed with Cyclopean concrete, using 50,000 tons of cement; an inland sea is being created, covering 13,000 acres, and embracing 33 billion cubic feet of mountain waters, which are to be led, at the rate of 1,000 feet a second, through 350 miles of natural and artificial channels to the Northern Murrumbidgee Irrigation Area.

From Junee to Narrandera we pass through a series of rapidly-growing townships, each station offering a pile of bagged wheat as mute evidence of the prosperity of its hinterland. Red fallows and brown stubble-fields, with here and there a patch of green summer crop, show that Riverina, once the home of the shepherd, has passed into the hands of the wheat-grower. One's fellow-travellers speak of wheat yields and prices, of summer cultivation and fallowing, of cheap lands in the dry belt which can be made to give good crops. None speak of irrigation.

At Narrandera, one still sees the familiar stack of wheat, and hears the loud crack of the teamster's whip. The old town, built upon the great pastoral industry in the west, and sustained by this and the produce of the

dry farmer, has a new and wonderful future before it. To the north-west, and, later, to the south-west, the two Murrumbidgee irrigation schemes will soon be in full operation, and Narrandera will receive the bulk of the trade.

The half-hour's run to Yanco takes us over nearly level sheep country, studded with box and pine, the sandy soil covered with dry, ripened barley grass almost as tall as a field of wheat. The land receives little summer rain. Probably it had much the same appearance when Mitchell first crossed it, except for the long, light-brown bank to the left, which winds about to follow the gentle undulations of the ground, but gradually comes nearer and nearer. Suddenly it turns straight for the line. A glance at the brown waters of the Northern Murrumbidgee Canal, and then a pleasing contrast is afforded



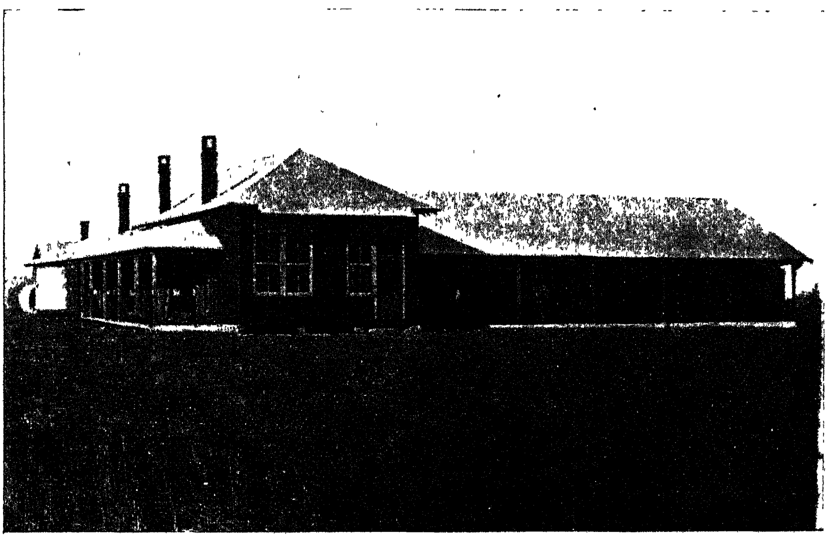
Manager's cottage, Yanco Experiment Farm.

by the flourishing dark-green orchard and bright lucerne paddocks of Yanco Experiment Farm. Irrigation, the oldest of all methods of farming, is the last to be adopted by us.

The Farm.

Before the completion of the great scheme was in sight, the Department of Agriculture obtained from Sir Samuel McCaughey, the father of irrigation in Riverina, an area of 290 acres, close to Yanco Railway Station, and on the route of the Northern Canal. Of this area, 200 acres are irrigable land, but the balance is too elevated for the purpose, except by pumping, and will be used for dry-farming experiments and for running stock when grass is available. The dry area is on the opposite side of the canal from the main farm, with which it is connected by a substantial bridge.

The soil at the Farm is classed under the scheme as of second quality, and is inferior to the great bulk of the area to be irrigated. It is a clay loam, of a reddish-brown colour, and the surface sets very hard. The majority of the irrigation settlers will have much less trouble in cultivating their lands than has been experienced at the Farm. The advantages of the site are that it is close to the railway, and that the clay subsoil is freely interspersed with limestone nodules. The water soaks laterally very well, furrows 5 feet apart being quite sufficient to saturate the soil. The area adjoining to the north, though still second-class land, is even better from a seepage point of view. The first-class soils, as explained by Mr. Guthrie in the *Gazette* for August, 1910, are deep, light, sandy loams, with clay and limestone particles at a depth of 2 feet.



Apprentices' quarters, nearly completed, Yanco Experiment Farm.

Generally speaking, no manures will be required on this soil until it has been exhausted by cropping. Last season Mr. Chomley manured the wheat field with superphosphate, but left at intervals three drill-widths unmanured as a check. No difference in growth or yield was apparent, either to the eye or from the weighing-machine. But any sort of vegetable rubbish, such as scrapings from the horse-yard, has a wonderful effect in preventing the caking of the surface which follows the application of water. On the sandy loams of the better irrigation land, such a practice will be beneficial, and perhaps necessary, to maintain the humus content of the soil, though caking will not be so pronounced.

Buildings on the farm include apprentices' quarters (just completed), manager's cottage, stables, hay-shed, and other necessary structures, whilst outside the homestead block several cottages have been provided for

employees. Twelve apprentices will shortly take up their quarters at the Farm. A contract has been let for a cottage as a residence for permanent workmen.

The Water.

Up to the present time, the Farm has had to depend upon a water-supply obtained by pumping from Yarangery Billabong. This supply has been uncertain, and, moreover, it has not been possible to deliver it at as high a level as the canal surface; consequently, some of the land which will be irrigated has not yet been broken up.

Writers on American irrigation assert that many of the waters in that country contain valuable fertilising ingredients, and that irrigated land is thus improved rather than diminished in fertility. We are not so fortunate, as the Murrumbidgee water contains no sediment of any great manurial value. Settlers will, however, have one outstanding advantage—the supply is as certain as it is humanly possible to make it. Even such a drought as that of 1902 would not prevent the Northern Murrumbidgee Canal from running at its normal height.

The Orchard.

The orchard, of 76 acres, was planted under the direction of Mr. W. J. Allen, Fruit Expert of the Department, and the preliminary work has been described by him in the *Gazette* for November, 1908. The trees are now in their third year, and some idea of their flourishing condition may be gained from the illustration which shows some of the twenty-eight months' old peach-trees at the end of January. The stone fruits (peaches, apricots, plums, prunes, &c.) have done remarkably well, and intending settlers need have no fear as to the ability of the soil to grow these fruits. Any sort of grape will do well at Yanco, and figs grow almost wild. Citrus-trees are very successful, but the district is hardly suitable for apples; although some varieties do fairly well further west and may prove profitable there.

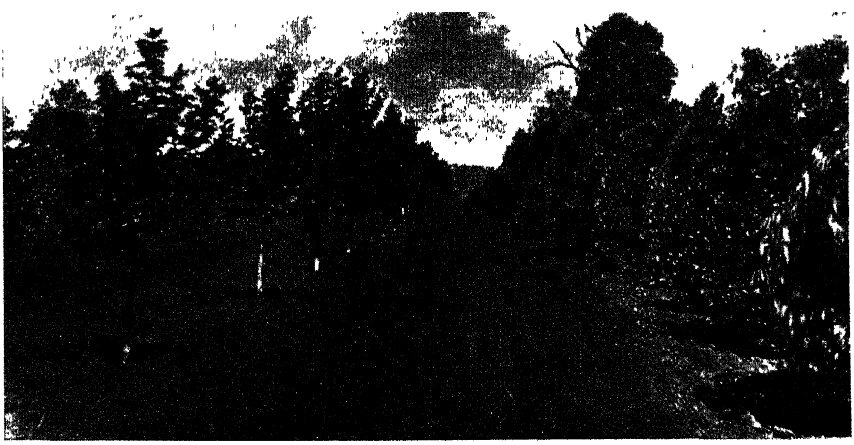
Lucerne.

At present, 28 acres are laid down with this valuable fodder crop, and the large hay-shed is nearly full of lucerne hay, obtained from a rapid succession of summer cuttings. Lucerne thrives exceedingly well at the Farm, despite the fact that it is only second-class lucerne land. It seeds well in odd corners not reached by the mower; and the seeds find their way to the roads and horse-yards, where they germinate freely. It speaks well for the prospects of the irrigationists to say that this king of fodder plants is so prolific as to make the Farm officers regard it with some apprehension, as possibly becoming a pest on lands devoted to other purposes. Considerable difficulty is experienced in getting rid of a stand of two-years-old lucerne. It is necessary to keep it out of the orchard.

Lucerne Investigations.

Mr. Ridley, Experimentalist at the Farm, is giving a good deal of attention to the question of obtaining, by selection and possibly cross-fertilisation,

Peach-trees, 28 months old, Yanco Experiment Farm.



Young avenue of sugar-gums, Oriental planes, and kurrajongs, Yanco Experiment Farm.

Hay grown with one irrigation before sowing, Yanco Experiment Farm.

Carting hay, Yanco Experiment Farm.

strains of lucerne more fitted for our conditions of soil and climate, and at the same time more commercially valuable. Seeds of types in cultivation in various parts of the world have been planted in rows for comparison, and also in strips the width covered by a broadcast seeder. The rows were sown last spring, and have been irrigated twice. Judging from their appearance at the present time, the most valuable type would appear to be Arabian. It is a fine-stemmed, bright-coloured, leafy type, not growing very high, but having a large proportion of leaf to stem. Peruvian appears to be second best, with Tamworth a close third. In the strips, sown last autumn, pride of place seems to be divided between all the Australian seed—Tamworth, Hunter River, Mudgee, Queensland, and others—with the qualification that Tamworth seed came away best, and gave more plants per square yard. The foreign seeds tested have proved inferior in this field trial, though Arabian has not been included. There are several factors, however, which would militate against absolutely final conclusions being drawn from these tests, such as acclimatisation, care in preparing the seed for market, and so on.

Let one of our readers go through his lucerne paddock and examine individual plants. He will find extraordinary differences in size, shape, and colour of the leaves, density of foliage, size and succulence of stems, and habit of growth generally. It is difficult to find two plants even approximately alike. May not these differences indicate types which have special merits or defects under different conditions? If we can select and propagate those types which are most valuable for particular purposes, may we not obtain strains of lucerne which will be as great an advance upon that now cultivated as some of the late Mr. Farrer's wheats are upon the older varieties? For instance, might we not produce a type of lucerne which would thrive under conditions as hot and dry as those in which Federation wheat reaches its fullest perfection? Cross-breeding with some of the other Medicks would probably assist towards the desired ends. Officers of the Kansas State Agricultural College are working in this direction, and Mr. Ridley wishes to proceed on similar lines here. It is highly technical work, requiring considerable scientific knowledge, such as a grasp of Mendel's laws of inherited characteristics, and some apparatus. The efficacy of propagation by root divisions has been proved at Yanco, and this will be of great assistance in obtaining supplies of suitable fixed types. But the work is as yet in its infancy.

Cereals.

It is unlikely that wheat will be grown for grain under irrigation. Fairly good crops can be obtained in the district by the cheaper dry-farming methods; and we must recognise that the available land in the true wheat zone of New South Wales is far from being all under crop. Probably 40 bushels per acre would be required to make irrigation pay. But for hay, there will generally be only one irrigation required, and good profits may be expected. Last year the cost at the Farm worked out at £1 9s. 9d. per ton of hay, which included wages of ploughman, 7s. 6d. per day, and labourer 7s. per day of 48 hours per week; 2s. per day for each horse's labour; 10s. per day for

binder; 2s. per day for a plough, and other implements in proportion. The price received locally for the chaff was £4 per ton, leaving £2 10s. 3d. to cover chaff-cutting, bags, and rent of land. The price received for the chaff is, however, higher than would generally be obtained. The area sown last year was 28 acres, and the best variety was Zealand. White Lammas, the variety sold as above, has a good deal of dead flag. The single irrigation is given before sowing. This is cheaper than irrigating whilst the wheat is growing, as the farmer can see where the water goes. To irrigate a growing crop requires an extra man.

Skinless barley gives excellent hay; but malting barley, probably the most valuable grain crop of all, has not been tried under irrigation. Kinver's Chevalier was grown dry; water was not obtainable when required. The yield was small, as Yanco is outside the area of sufficient rainfall for growing a good sample of barley. Irrigating it will be a task requiring a great deal of knowledge and care, as it is very easy to spoil barley required for malting. One thing is certain—any barley grown on the irrigation area will be of excellent colour. The rainfall averages about 16 inches. If this were supplemented by irrigation to total 20 inches, and the barley got a good start in the autumn, Mr. Chomley considers that good results might be anticipated by farmers who study the effect of the water closely.

Oats are grown for hay under the same conditions as wheat—one irrigation before sowing. Algerian has a tendency to go down; last year it lodged badly, and was difficult to cut with the binder. White Horse and Abundance are stronger in the stalk. One crop of oats yielded 3 tons 1 cwt. per acre, and the 5 acres averaged about 3 tons.

Green Fodder Crops.

A trial crop of sorghum (Early Amber Cane and Planter's Friend) grew to a height of 9 or 10 feet after three irrigations, but as there were no cattle on the Farm the produce could not be utilised for feed. It was made into hay, and used for roofing fowlhouses, making butts for haystacks, and in other ways. A small test was made of cutting it up and mixing it with wheaten chaff, but the sorghum sent the wheaten chaff mouldy. At the present time 2 acres of late-sown Amber Cane and Planter's Friend are being grown for the cows kept to supply milk for the apprentices' quarters.

Cowpeas grow well under irrigation; rape, mangels, and sugar-beet have not yet been tried. But with sorghum, lucerne, oats, Skinless and Cape barleys growing to perfection, the range of fodders available for dairy cattle is already pretty wide.

Maize for grain has not proved a success, owing to dry hot winds affecting the silk at a critical stage. This may, however, be overcome by sowing at a different time.

Potatoes.

This crop has not given good results. The soil is too hard for the tubers to form, and is also deficient in humus. Second growth is another trouble. Potatoes would need to follow a green crop ploughed in to open up the soil

and supply humus. Late sowings, to avoid frosts, will also be advisable the experience of last season is repeated. Probably better results will be obtained on the lighter soils to the north.

Three varieties were tried this season—Early Rose, Cambridge Kidney, and Brownell's Beauty. The Early Rose gave by far the best yield, computed at 4 tons 6 cwt. per acre.

Preparing the Land.

Another great advantage possessed by Riverina irrigationists is the level nature of the country. The slope is generally just about what is required to let the water flow steadily, so that expensive levelling will seldom be required. After clearing, holes left by trees and other irregularities are filled in with the "buckscraper," which can be made by any blacksmith or purchased ready made, and then the ground is smoothened with a home-made leveller. The cost of grading the land at the Farm did not exceed 15s. per acre.

The laying-out and making of the channels is a more difficult matter, and requires skill and judgment. Water will not run up-hill; but even an experienced man relying upon his eyes alone would often be disappointed by finding that his channels fail to carry the water. A simple level and surveyor's staff are indispensable, and several makes are on the market. Their use requires a little practice, but there is nothing very difficult about it. Channels may then be made with the plough and "crowder"—a home-made implement of great value—according to the contour of the land and the method of irrigation proposed. Some hints on these matters were given by Mr. Chomley in the *Gazette* for October, 1905, and further information will be found in any standard text-book on Irrigation.

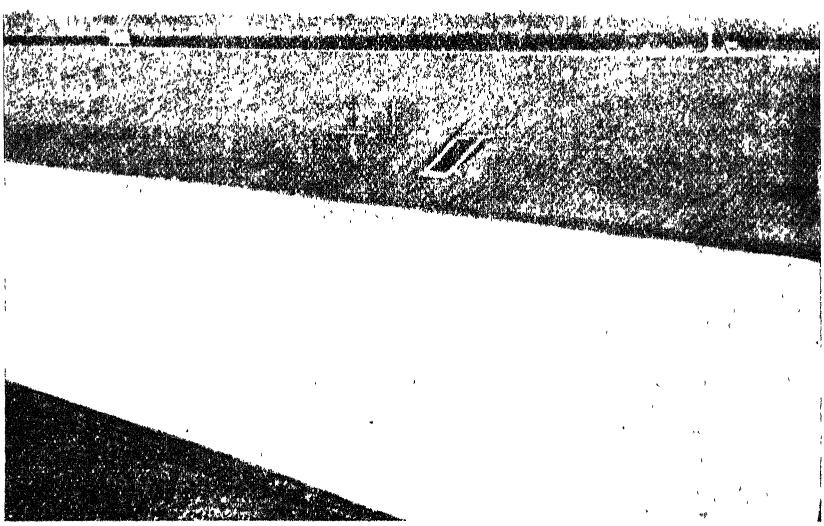
The "Duty" of Water.

This is an expression used to denote the quantity of water required for a particular crop, which is rather a complex problem. Probably the first mistake which a novice will make will be to give too much water. American investigations have resulted in a great reduction in the quantity of water used, as the early practice of repeated heavy waterings was found to be doing serious harm. It is well known that standing water soon kills out a lucerne patch; and Mr. Chomley has proved that the same result can be obtained with even our native timbers. Under-irrigation means reduced yields, but over-irrigation kills the crop.

The unit of measurement of water to be used on the Murrumbidgee scheme is a cubic foot per second. This is much simpler than the American method of calculating by "miners' inches." A cubic foot of water per second (or to adopt the engineer's contraction, a "cusecond") will cover 10 acres of land 2½ inches deep in twenty-four hours. A rough estimation may be made that this will irrigate 200 acres of cereals, or 400 acres of orchard or vineyard, provided the rainfall is not below 15 inches. Lucerne and summer crops take much more.

The supply to each holding will be measured by a simple, reliable, positive meter. At the Experiment Farm provision has been made to measure the flow from the canal by an inferential meter, which was obtained before the positive meter was invented.

The maximum quantity of water proposed to be allowed to the Experiment Farm from the canal is $4\frac{1}{2}$ cubic feet per second; but the supply hitherto received from the billabong has been uncertain, so that Mr. Chomley has been unable to make any accurate tests of requirements for crops. Still, some idea may be gathered from the actual experience this last season with the different crops, as shown by the "Irrigation Journal"—a cross-ruled card, kept in the Farm office, on which the date of watering each crop is shown.



Northern Murrumbidgee Canal, showing off-take to Yanco Experiment Farm. The water is not yet down to the Farm, but a few feet of water have been let down to soak the channel.

ORCHARD.—Hitherto the aim has been merely to keep the trees growing, as they are only now coming into bearing.

Stone Fruits.—Irrigated in October; when in bearing they may require a second watering as the crop is ripening, depending on the season.

Grapes, Sultanas, and Currants.—Irrigated early in November.

Figs and Loquats.—Early in December.

Citrus Fruits.—Early in November, and again towards end of December Oranges require water more often than stone fruits.

The trees and vines are irrigated by running furrows with the plough down each side of the rows about the ends of the roots. When they are

older and the roots developed, extra furrows will be run more towards the centre, the aim being to water the land equally all over. Sufficient water is run into the furrows from the head channel to keep it moving slowly, allowing soakage to precede the flow. When it reaches the bottom of the furrow it is still allowed to run slowly until the last plant is thoroughly irrigated, when it is turned off. It will flow about 500 feet in twenty-four hours.

LUCERNE.—Block 7—Irrigated beginning of December, and again end of December. (This was spring-sown in September.) Graded to ½ acre plots.

Block 8—Irrigated October, beginning of December, and end of December. Graded to contour checks.

Block 12—First week in November and first week in December. Graded to long narrow checks.

Block 13—Towards end of October, first week in December, and end of December. Graded to wide checks.

Lucerne is best irrigated in long narrow "checks" when the slope is suitable, the banks running at right angles to the contours, as explained by Mr. Chomley, in October, 1905, *Gazette*. At the lower end of the block a waste drain should be provided. The slope of the land will not always permit this, and it is often a question of the better of two bad ways to lay out the checks.

In watering before the lucerne is sown in autumn, the best practice is to run small furrows with a Planet Junior, or similar implement, so as to give direction to the water, as the slope of the land will not permit of the water spreading evenly over the surface, thus ensuring an even germination of the seed. When the lucerne is growing it offers sufficient resistance to the flow of water to cause it to spread over the whole width of the check. After watering, level off any irregularities disclosed; then scarify, harrow, and sow. The lucerne will be well up for the spring irrigating. Spring sowing avoids barley grass; but this may also be overcome by irrigating in March, so as to germinate it, and then discing it.

Under good conditions lucerne will give five crops per annum at Yanco. The growing season is not as long as further north. Each crop may require two waterings on the heavier soils of the Farm; so that if rains absolutely failed, ten irrigations might be required. The land is flooded to a depth of 2 or 3 inches each time. It should not be irrigated until about four days after cutting, as the stems must be allowed to close or the crowns will be injured. It is also necessary to see that the water can be drained off as soon as it is found that there is no escape for it except by evaporation, as "lucerne will not stand wet feet," and is killed by standing water, especially in the heat of the day.

GRASSES (7 acres of different varieties for trial).—These were irrigated at the end of October, early in December, and again at the end of December.

VEGETABLES.—Water was given whenever it was running.

In January, 365 points of rain fell, so that all irrigation was suspended.

On the first-class lands, which have an open, porous subsoil, more water will be required. They would probably need 2·5 cubic feet a second when the second-class lands require 2 cubic feet. But the greatest danger is over-irrigation. A rough guide is to take a handful of the soil 6 inches from the surface and press it in the hand. If it "pugs," that land does not require watering. Farmers are inclined to over-irrigate in the hope of avoiding the second and equally essential part of this class of farming, and that is cultivation.

Cultivation.

At Yanco Farm the ground, and the horses too, are given a spell in winter. For the rest of the year the cultivators are always at work. Whenever a portion of the ground can be got at, it is cultivated, particularly as soon as it is dry enough after irrigating. The reasons are the same as those which make it advisable in dry farming, but the necessity is greater. It is to form and maintain the mulch, thus conserving the water in the soil, keeping it sweet and encouraging bacterial action, and to suppress weeds.

In the orchard, as soon as the prunings are picked up, the ground is ploughed and harrowed the same day, as the comb dries hard and lumpy. Then the springtooth cultivator, worked by two or three horses, is set to work and kept going. When it reaches one end it is brought back to the other for another start. Of course, when cover crops are grown, the cultivator will have a rest for a while. After late autumn, the citrus fruits are kept clean, but stone fruits and vines are allowed to rest until after pruning. The Planet Junior one-horse implement is used for filling in the furrows after irrigating; also amongst the vines generally, and any row crops such as potatoes.

On the lucerne the double disc cultivator is used, with the discs set nearly straight. It is not found necessary to set them as straight as is advocated by American writers, as even if an odd plant is cut off it grows again. Lucerne is very hard to kill at Yanco. One block of 7 acres disced last year gave a cutting of 8 tons in January. Another similar block upon which Mr. Chomley was experimenting with other machines gave only 4 tons. Mr. Chomley considers the double disc cultivator the best all-round lucerne implement on the market for his conditions, and it is constantly used, particularly after irrigating.

So it would appear that the two "Don'ts" for the Murrumbidgee irrigationist are—"Don't over-irrigate" and "Don't stop cultivating."

Prospects of Settlers.

The opinion of Mr. Chomley, who has been working as an irrigation farmer on the Northern Murrumbidgee area for some two or three years, should be of value to those who are applying for blocks thrown open by the Trustees. He considers that the most profitable line will be dairying.

There is plenty of pasture all the year round—barley-grass, crowfoot, and trefoil—except for the short pinches of three months or so in summer. During this period the cattle would have the irrigated lucerne, sorghum, and other fodders.

The fattening of sheep and raising of early lambs would also probably be a very profitable undertaking for two partners, one of whom would stay at home and attend to the growing of lucerne, rape, and other fodders, while the other would be able to go away and buy small lots of sheep, dispose of lambs, and so on. Each should be a specialist in his own line. Two men in the district now are proposing to adopt this method upon a fairly large scale. Another settler proposes to go in for pig-raising on lucerne, which may be found very profitable.

Portions of the area will be found eminently suitable for different classes of fruit; but it must be recognised that this is a young country with a comparatively small home market. Until the export market is worked up on sound lines, farmers will do well not to rush the planting of orchards all over the area. Still, there is a ready sale for fresh fruits of good quality on the Sydney market, and growers would probably find this a good line, provided the varieties chosen were such as could be used otherwise in case of a glut. Canned peaches and apricots offer large scope, as there is an enormous market for these. Late grapes should be profitable if exported to England. Mr. Chomley considers the Sydney fresh-fruit market the best all round to cater for, avoiding over-production.

Much the same applies to the dried fruit industries. Mildura, Renmark, and other places have the Commonwealth trade well organised, and another great fruit-drying centre would have to depend upon the export trade. There is no reason why we cannot compete with other countries for the foreign trade, particularly to the East; but we must go slowly and not let our production seriously overstep the markets available.

Potatoes will always find a good market if it can be shown that they are suitable for the soils and conditions of the area. Hay and chaff can be produced at a certain profit, especially in seasons of light rainfall, when dry land crops are reduced; and the great undertaking will help the State very materially should such unfortunate seasons as that of 1902 return to us.

Growing lucerne, making it into hay, pressing into convenient bales, and holding it over for the ever-recurring periods of shortage, should, with those who have capital to tide them over the long wait, be a very profitable business.

It is hoped that these notes may be of interest to those readers who may be considering the question of taking up irrigation blocks. Irrigation on the Murrumbidgee area will not be "Chinese farming"; it will be farming on the most scientific lines. The dry farmer needs to know how to cultivate his land, what crops to grow and how to harvest them; the irrigationist needs to know all this and much more—the "duty" of water and the principles of its application. But if the bulk of the settlers are obtained

from outside the Commonwealth, it will not be due to want of enterprise on the part of our people. Men such as those who have turned the trackless Richmond River district into one of the world's greatest dairying centres, or those who are now felling timber on the Dorrigo hills, would not consider the running of a few channels an insurmountable task. But our farmers have not studied the principles and profits of irrigation; and they have inherited a love for larger areas than can be worked under this system of farming. Still, hard cash will yet win the day, as it has done on the little gold-mines of lucerne along the Hunter and in Nemingha Valley. The time of small areas is coming, and while much of the romance of the country will vanish, we have ample consolation in the knowledge that the change will bring better conditions of home life, better education for the farmer's children, and a longer firing-line when the bugles are calling.

Meanwhile, in Narrandera's cedar-lined streets, the hammer and the trowel are at work. Many handsome new business places and residences have already been erected in anticipation of trade, and in a little while we may expect to see a sudden and wonderful development, which will indeed be necessary to supply the demands of the settlers. Our primary industries can never be independent of the secondary ones. Irrigationists will need implements, harness, household provisions, and other necessaries of farm life, as well as stores for the disposal of their produce. The business people need not fear that the great scheme will burst and leave their capital locked up in useless bricks and timber. The scheme is as sound as it is possible for human brains to make it. Town and country alike should look upon this as the greatest lift Riverina has ever got, and be ready to profit by it; having faith in the country which only needs such undertakings as this to step into its true place among the nations of the world.

Obtaining Departmental Advice *re* Silo Construction.

Farmers desirous of obtaining the advice of the Department in regard to the construction of silos are requested to frame their letters so as to answer the following questions. The officers will then be in a better position to assist them:—

1. What number of stock do you wish to feed, and for how many months in each year are you likely to require to feed silage?
2. What crops do you intend to grow for ensilage?
3. What power have you for cutting and filling?
4. Is the proposed site level? If not, what grade?
5. Can you place the silo in a hillside? What is the grade?
6. What distance are you from the nearest railway or port?
7. Are any of the following materials available on or near the site: suitable stone to break; river or creek shingle; clean sharp sand; water?
8. Can you state the price of Portland cement, delivered on your farm; also the prices, delivered, for hardwood, sawn timber and pine, stating what varieties are obtainable?
9. Are white ants very prevalent in your district?
10. Do you wish to build the silo with farm labour only?
11. Have you had any previous experience in concrete work or rough carpentry?

Farming in Jindabyne (Monaro) District.

H. ROSS, Inspector of Agriculture.

As long as forty years ago, if records can be relied upon, payable crops of wheat and oats were obtained in and around Jindabyne, and many of the older inhabitants informed the writer that crops of from 40 to 50 bushels per acre were the rule rather than the exception. Whether these figures are in accordance with facts, or can be confirmed by statistics, I am not prepared to say, but certain it is that sufficient wheat was grown in the early days by local farmers for their own and their stocks' requirements.

When, however, the wheat belt in the southern part of this State began to produce cereal crops; when labour-saving appliances, such as the stripper, came into existence; when the single-furrow ploughs had to give way to the three and four-furrow implements; in fact, when wheat could be produced cheaper in the Riverina than in Monaro, the Jindabyne farmers, instead of growing their own cereals, procured them from the Riverina. From this out, not only wheat-growing but most agricultural industries lapsed, and the district became one almost entirely devoted to pastoral pursuits.

FIELD EXPERIMENTS ON JINDABYNE WEST ESTATE.

One of the first landowners to foresee the agricultural possibilities of this district was Sir Joseph Carruthers. In conjunction with the Department of Agriculture, and also on his own account, he carried out field experiments extending over a period of several years on the Jindabyne West Estate. The results of these experiments have left little room for doubt that farming in conjunction with pastoral pursuits is a sound business proposition in the Jindabyne district

It may be mentioned here that the soil in the hilly country is of a granite formation, whereas the flats, of which there is no scarcity, are composed of a rich black alluvial deposit, reaching in many cases to a depth of 15 to 20 feet.

Rape.

One of the chief difficulties experienced by farmers and stock-owners in Monaro is the absence of green winter feed. In past years rye and oats had been tried with but indifferent success; though the frosts did not materially affect the young plants, their growth during winter months—at a time when a bulk of green feed was most needed—was stationary.

In February, 1909 and 1910, areas of 15 and 5 acres respectively were sown with rape. Four pounds of ordinary Essex rape per acre were sown broadcast on river-flat land, which had previously been ploughed to a depth of from 6 to 7 inches; and after sowing, the land was rolled with a Cambridge roller.

In both instances a splendid germination of the seed took place; and despite continued frosts, the rape flourished, making new growth even during the coldest weather. When it had attained a height of from 12 to 18 inches, fourteen cross-bred lambs per acre were turned in and fattened. The lambs secured top price in Sydney market. A second growth of the old stalks allowed another five sheep per acre to be topped off. The experiment has decisively demonstrated the advantages accruing from an autumn sowing of rape, and has shown a way out of the difficulty of providing green winter feed.

Potatoes.

In a paddock adjoining the one sown with rape, it was decided to test the soil and climate with regard to potato-growing. Planting commenced in the first week in November. The land had been ploughed 8 inches deep. Potatoes, at the rate of 8 cwt. per acre, were planted at a distance of 1 foot 6 inches apart in the rows, and 2 feet 6 inches between the rows, and were ploughed in to a depth of $4\frac{1}{2}$ inches. The soil being of a loamy, friable nature, it was necessary to horse-hoe the potatoes only twice between times of sowing and harvesting. Despite three very severe frosts, the returns proved satisfactory. The outstanding feature of the experiment was the demonstration of the suitability of some and the unsuitability of other varieties for this particular climate.

HARVEST RETURNS OF POTATO EXPERIMENT.

Variety.	Yield per acre.			Time of Planting.	Time of Harvesting.
	Tons.	cwt.	qrs.		
Red Ruby..	7	11	0	First week in November, 1909.	End of May, 1910.
Brownell's Beauty	4	14	1	,,	,,
Satisfaction	4	0	1	,,	,,
Early Rose	2	16	2	,,	,,
Bliss' Triumph	2	9	0	,,	,,
Cambridge Kidney	2	0	1	,,	,,

Lucerne.

It would be difficult to find any of the Snowy River or other alluvial flats at Jindabyne on which lucerne could not be grown. A thorough preparation of the soil—that is, ploughing the land to a depth of 8 inches, and subsequently working it with cultivator and harrows to a fine tilth—is, however, essential to success.

Several large paddocks were treated in this manner. The seed, 12 lb. per acre, was broadcasted, and, as in the case of the rape, rolled in with a Cambridge roller. Sowing took place between the middle and end of February. In every instance splendid results were obtained; besides several cuttings—10 to 12 cwt. of hay per cutting—the paddocks are utilised for grazing purposes during certain periods of the year.

Cereals.

For wheat and oat production the river flats are not so suitable as the higher land. The reason for this is found in the facts that, firstly, the flats are too rich for wheat-growing; and, secondly, frosts are more severe on the lower than on the higher slopes. Several crops of wheat on the flats were destroyed by frost during the flowering period, whereas those sown on the poorer granite country on higher land escaped the frost and gave good results.

From 1½ to over 2 tons of hay, and an estimated yield of from 20 to 25 bushels per acre, according to locality, were the results of this season's trials. The variety of wheat which has proved most suitable for the district is Cleveland.

Satisfactory returns have been obtained from rye (Black Winter), and Algerian and White oats, for hay.

Grasses.

The improvement of the natural pastures has received a considerable amount of attention on the Jindabyne West Estate. English rye-grass, cocksfoot, and prairie prass, sown on the black land, have invariably established themselves well. *Paspalum dilatatum* proved itself to be a fine summer grass, especially so where sown in damp and swampy places. *Phalaris* and Kentucky Blue are spreading well.

Sheep's Burnet is destined to be one of the best fodder plants for Monaro; sown either in spring or autumn, it readily establishes itself, and in a short space of time produces a thick coat of excellent herbage.

Another herb, Yarrow, is growing wonderfully well along the watercourses. Only a small quantity of this was sown originally, but it is now spreading well in moist places.

Conclusion.

From the foregoing facts it will be seen that parts of Monaro are suitable not only for pastoral but also for agricultural purposes. The fact that little farming has been done of late years is due more to lack of suitable and up-to-date farming implements, and lack of men who thoroughly understand all branches of farming, than to adverse soil and climatic conditions.

The average annual rainfall for the last twenty years is 26 inches.

KURRAJONG APPLES.

MR. JOHN RYAN, Kurrajong Heights, brought to the Department some exceedingly fine specimens of Munroe's Favourite, Five Crown, Jonathan, and Granny Smith apples. In the open market Mr. Ryan's Jonathans brought 14s. 6d. per case this year. The Five Crowns were also particularly fine.

Mr. Allen, the Fruit Expert, considers that these apples are an excellent demonstration of the fruit-growing possibilities of the Kurrajong, and indeed of New South Wales generally.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 106. *Cynodon ciliaris*, Benth.

Botanical Name.—*Cynodon*, Greek, *kuon, kunos,* a dog, *odous, odontos,* a tooth, dog's tooth; *ciliaris*, Latin, meaning like an eyelash, in reference to the hairs on the leaf-sheaths and elsewhere.

Vernacular Name.—"Couch grass" of the interior.

Botanical description.—A dwarf species, with the creeping habit of *C. dactylon*, the erect flowering stems 2 to 3 inches high in our specimens.

Leaves short, the sheaths ciliate with long, fine-spreading hairs.

Spikes, 2, 1 to 1½ inches long, rather more rigid than in *C. convergens.*

Spikelets rather smaller, converging in two rows on a flattened rhachis, the rhachis of the spikelet not produced above the flowering glume.

Outer glumes, 1½ lines long, the keel acute but scarcely winged.

Flowering glume, broad and very concave, much shorter than the outer ones, shortly ciliate on the keel and margins, with a transverse ring of long spreading hairs near the end.

Palea, not much narrower than the glume, with a similar ring of hairs, the two nerves not closely contiguous. (B.Fl. vii, 610.)

The spikes, which are normally in pairs, are occasionally in threes in the New South Wales specimens. The leaf-sheaths of the grass are *ciliate with long hairs*, and from this the specific name *ciliaris* is derived.

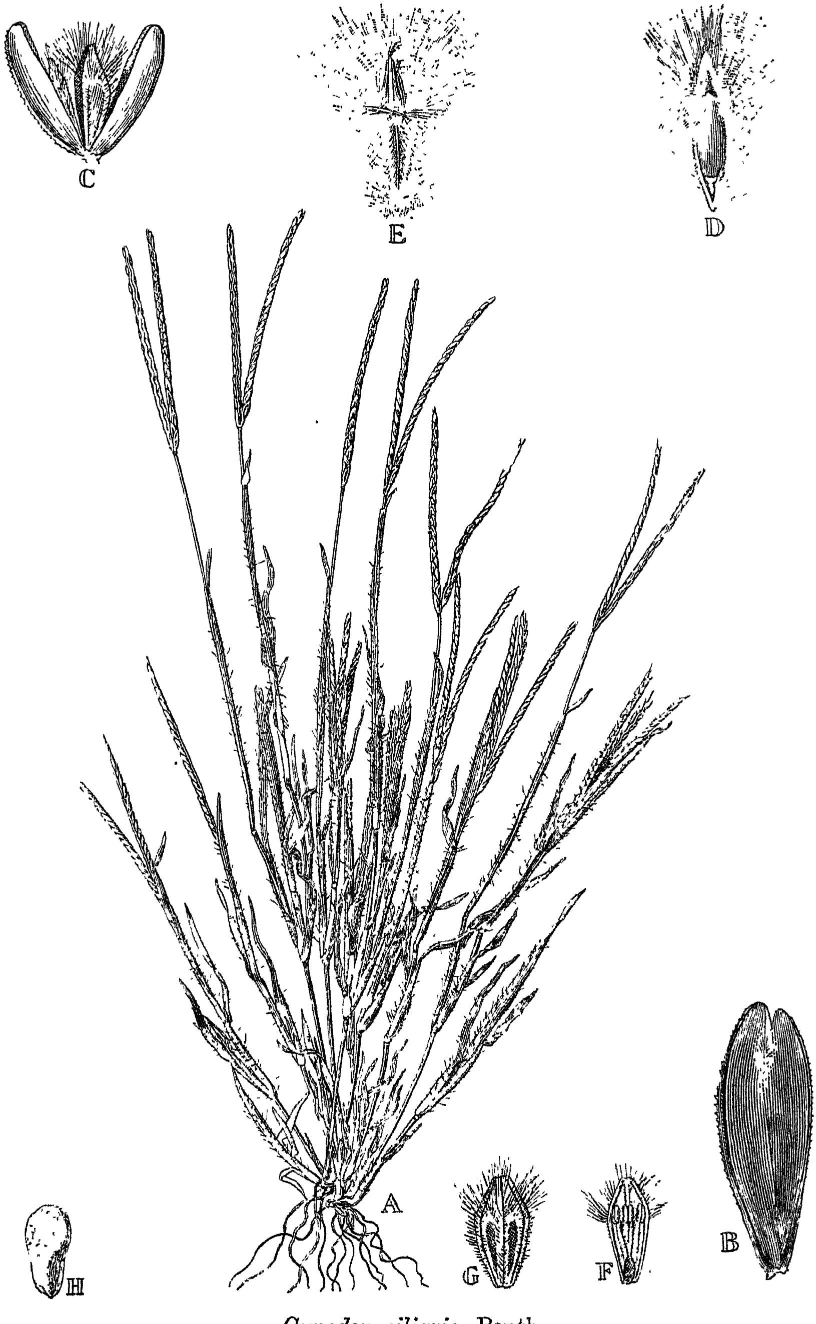
Fodder Value.—I believe it to be precisely that of the common Couch grass (*Cynodon dactylon*), so well and so favourably known in the warmer coast districts.

Habitat.—It is recorded from Charlotte Waters, Central Australia, collected by Arthur Giles, the explorer, as noted in the *Flora Australiensis.*

So far as I know, it was not again recorded until Maiden and Betche (*Proc. Linn. Soc. N.S.W.*, xxxi, 740, 1906) recorded it from Yandama, in North-western New South Wales, where it had been collected by Mr. A. W. Mullen, L.S.

EXPLANATION OF PLATE.

A. Entire plant.
B. A single spikelet in its natural state, enclosing the flowering glume.
C. A single spikelet, the outer glumes pulled apart to show the flowering glume and palea.
D. Flowering glume, seen from inside.
E. Flowering glume, seen from the back.
F. Palea, seen from inside.
G. Palea, seen from the back.
H. Grain.



Cynodon ciliaris. Benth.

Potato Blight (*Phytophthora infestans*).

E. D. BUTLER, Inspector, Department of Agriculture.

THIS terrible fungous disease has caused most serious losses to potato-growers during the present season. Its first appearance in this State was noticed in September, 1909, when its ravages were mainly confined to potatoes on our coastal areas, but unfortunately now it is more widespread, and has attacked growing crops in nearly all our main potato-growing districts. While the disease is known to be a terrible scourge, there is a redeeming feature about it—the cause of the disease is so thoroughly investigated, and the life history of the fungus so well understood, that we are now in a position to cope with it, to minimise its injurious effects, and to prevent its spread. This can only be done by timely spraying, and, assisted by our normal hot summers, the disease can, no doubt, be controlled.

Cause of the Blight.

Potato blight is caused by a fungous disease which works upon the tops of the potato plant, and which also causes rotting of the tubers. The disease spreads with great rapidity, sometimes ruining a crop in a few days, and appears to thrive best when the temperature is about 70 degrees Fah., and the air is full of moisture. It is worse in wet seasons than in dry ones, and the fact that the disease flourishes best in such seasons has caused many farmers to believe that blight is caused by wet weather. This is true, in part, as wet weather furnishes the ideal conditions for the rapid development of the fungus; but the real cause is the presence of the disease upon the crop or plant when the wet weather sets in. We may have wet weather without having blight; and, *vice versa*, we may have blight without having wet weather. The two are not inseparable. From the nature and life history of the fungus it will readily be understood that its glow or rapid development will depend largely on the weather.

It has been believed for a long time that the virulence of the disease depends on the rainfall—the greater the rainfall the more virulent will the disease become. This condition has been noted in our coastal areas where the rainfall has been excessive.

The age of the potato plant will also influence the result. If the potato plants are young and succulent and growing vigorously, the infection will be severe and widespread, but if it is towards the end of the growing season, when the foliage naturally begins to die, there will be less damage done.

The nature of the soil sometimes also plays an important part in the distribution of the fungus. Heavy soils which dry slowly favour it, while light soil discourages it; but, in the case of an epidemic, such as we have lately had, it is not so much the soil as the season that determines it.

No doubt our normal summer weather will exercise a controlling influence upon the development of the fungus, which, in part perhaps, explains why in certain districts there may be no serious development of the disease, and why an early-planted crop may escape, while a late crop may suffer. From experiments conducted in America it is said if the temperature rises to above 80 degrees Fah. for any length of time, or even for a few days, the disease is checked, because the reproductive bodies of the fungus cease to be formed; but, on the other hand, if the normal temperature is from 70 to 74 degrees Fah., then the conditions are most favourable for the spread of the disease, provided the necessary moisture is present.

The disease usually appears on the lower leaves of the plant in the form of a yellowish-brown spot that rapidly turns black and dies. The trouble rapidly spreads upon the plant. until soon nothing green remains to be seen but the extreme top leaves. These, too, soon succumb, and the whole top dies and rots. If one of these yellowish-brown spots is examined early in the morning when the dew is on, a fine white mildew-like substance will be seen on the lower side of the leaf. If this is examined with a microscope it will be found to consist of a large number of egg-like spore bodies, on minute stalks, projecting out of the leaf tissue The spores, which correspond to seeds, soon fall off the parent stalk and either fall to the ground or are blown to a neighbouring plant. If one of these spores finds lodgment on a potato leaf, and if moisture is present, it starts to germinate, and sends out a slender, thread-like branch (*mycelium*). It is believed this mycelium has no power in itself to penetrate the tissues of the leaf, so it grows on until it reaches some opening in the leaf; the opening may be the breathing pores (*stomata*) or some rupture caused by an insect. On reaching the opening, the little branch enters and pushes its way between the cell-walls of the leaf, robbing the cells of their nourishment. Once in the plant this mycelium grows very rapidly, branching again and again, and finally penetrating every part of the plant tissues, robbing them of their juices and causing them to decay. Occasionally a branch of the mycelium comes to the surface, and sends out many fruiting stalks that bear myriads of new spores; these mature, fall off, and go on their mission of destruction.

If spores fall to the ground and rains follow, they may be washed downward through the soil until they find lodgment on the tuber. Here they find warmth and moisture, and begin to grow, sending their mycelia into the tuber, robbing it of its starch, breaking down its tissues, and causing rot. Here its action may or may not be rapid. The spore may sprout, enter the tuber, and make only slow growth, not manifesting itself until the potato is dug and stored, or perhaps not until the potato has been planted for the next crop. So the disease may be passed on from one crop to another by means of infected seed potatoes.

It will be seen that the risk from this, which is called the external mode of infection, should be sufficient to warn potato growers to be careful to avoid as far as possible the planting of infected seed or seed from an infected crop. If, however, clean seed is scarce, all tubers intended for planting should be

dipped in a solution of formalin—half pint to 15 gallons of water; stir thoroughly, and soak uncut tubers before sprouting for two hours, then place in clean receptacles and carefully dry. This treatment should not be regarded as an absolute preventive, but is a precautionary measure, and serves to destroy other fungi that might be present, such as scab, &c.

Some investigators say that the fungus is sometimes within the tissue of the potato, and when planted grows with and in the young plants. In such cases dipping would be of no avail; but, fortunately, they say this mode of infection does not often occur, the main source of infection being by spores borne by the wind, which alight on the leaves.

Preventive Measures.

It will be seen, then, that preventive measures must be adopted, and not curative. Spraying should be commenced when the tops are about 6 inches high. To wait until the disease has made its appearance is only courting failure, as the disease is apt to be present and make much progress before being noticed. It is then well nigh impossible to stop its ravages. Three or four sprayings should be sufficient, provided rain does not intervene; if rain comes spraying should be done immediately afterwards, or as soon as the ground will permit of its being done.

However, as to the number of sprayings required, growers should be the best judges. The object of spraying is to keep on the tops a thin film of the solution at all times. The work should be well done, for indifferent work only results in disappointment, and perhaps growers will be inclined to blame the treatment for the poor results, whereas they have only themselves to blame. The spray may be applied at any time if the tops are dry, and may be discontinued when they are in bloom.

Bordeaux Mixture.

This has been found the most effective fungicide, and the best results should be obtained if the following directions as to making the mixture are carefully observed:—

Dissolve 4 lb. copper sulphate (bluestone) in 5 gallons of water, suspending it in coarse bagging near the surface of the water. In another vessel, slack 4 lb. of lime in sufficient water and pour it into the copper solution, stirring at the same time until thoroughly mixed; then add enough water to bring up to 40 gallons. This is commonly known as the 4-4-40 formula. Before placing the solution in the pump it should be strained through a piece of bagging or cheese-cloth, otherwise the nozzle will become clogged with the undissolved particles of lime and bluestone. Sprayers should always be well cleaned after using, and care should be taken to empty out all the solution. In preparing this mixture, wooden vessels only should be used—a cask or hogshead sawn in two will be found very useful. One hundred gallons of this mixture will cost about 3s. to 3s. 3d. The price of bluestone is 3d. per lb., and lime, say, £2 per ton.

Spraying Machines.

There are many good and useful machines for this purpose on the market. For large areas an excellent spray cart is the "Fleming." With this cart five rows can be sprayed at a time. It embodies all the essential features necessary to an efficient spray, and has provision for keeping the liquid thoroughly agitated, which is very necessary. The pump is drawn by one horse, and is worked by a spur-wheel gearing driven off both wheels. With a barrel of, say, 80 or 100 gallons capacity, 12 to 15 acres could be sprayed in an ordinary day. The cost is about £30 f.o.b., Sydney. The pumps are not obtainable in New South Wales, but may be got from Messrs. Webster & Son, Davenport, Tasmania. The cost might appear heavy, but the capacity of the machine is sufficiently large to make it possible for several growers to combine in its purchase and use.

For small areas, say from 1 to 5 acres, there are many serviceable pumps offered by leading ironmongery establishments, and also by seedsmen. Small pumps of the knapsack type, carried on the back, would be found suitable for the purpose. The nozzle, preferably a Cyclone, should be adjusted so that the under surface of the leaves can be thoroughly sprayed. This is an important point, for this is where the fungus in its initial stages attacks the plants. Knapsack sprayers will cost about 50s. to £3.

In addition to spraying as a preventive measure, careful hilling is recommended, so to form a good covering for the tubers and to prevent the spores being washed down.

When shall we dig Blighted Potatoes?

Probably this is a problem which has confronted the grower lately, and with the abnormally wet season just experienced it is rather difficult to advise. In other countries the subject has claimed much attention, and the ultimate conclusion of some experimenters is that, if it is desired to store the tubers, they should not be dug until the tops are dead and thoroughly dry. As long as the tops remain partially green the spores of the blight fungus continue to live, and in the process of digging the tubers become covered with live spores, and, if conditions are at all favourable, more or less rot results. Precautions should be taken, after digging, not to cover the potatoes with tops that have been blighted, as they are liable to convey infection. All tops should be removed before digging, and effectually destroyed. If it is intended to market the potatoes, the tops might be removed when the tubers are large enough or sufficiently matured, care being taken to remove same to some remote place and effectually destroy them. If any infected tubers are found, they also should be sorted out and destroyed without delay.

The Colouring of Lemons and Oranges by the Sweating Process.

W. J. ALLEN.

DURING the last few years the growers of this State have planted a good many thousand Late Valencia orange trees, a variety which ripens late and hangs particularly well. The trees which are bearing are carrying good crops of fruit, which finds a ready market at remunerative prices. As December approaches, it has been found that the fruit loses its bright orange colour, and reverts to its original green. This in no way affects the flavour of the fruit, but the public will not pay the same price for a green orange, even though it be ripe, as they will for a good, bright orange-coloured orange; hence the necessity for colouring fruit which may have been allowed to hang until it has lost its proper colour and reverted to green. Lemons which are fairly well matured and of good size, may also be coloured in a somewhat similar manner as that to which the oranges are subjected.

While in California a few years ago I visited several large packing-houses where the colouring of fruit was being carried out, and it was a decided success. At the California Convention of Fruit-growers, held in Pomona last year, Mr. L. B. Williams, of Whittier, California, read a paper on the above subject, and I do not think I could do better than give his process in his own words:—

"Our first sweat-room consisted of a small room, single wall, paper-lined, large enough to accommodate one car of fruit at a time. This room was in the main building; in fact, it constituted the largest per cent. of the main building at that time. The fruit was washed and placed in our picking-boxes, and trucked into this room, stacked ten boxes high, papering the top box.

"When the room was filled, or nearly so, it was heated with kerosene stoves. The first stove was the kerosene drip stove; next we used the 'Perfection B,' also Perfection No. 813B, which is the same stove as far as the writer can see. The temperature of the room was held at 90 degrees as near as possible, this being the maximum. The temperature was regulated by the number of burners in the room. It was necessary to keep the fruit moist to keep it from wilting. This was done from evaporation by placing a vessel on the stove and filling it with water, the amount of moisture depending upon the number of burners required for the temperature, so the moisture at this time automatically adjusted itself.

"If we wished the fruit coloured quickly, this process would continue day and night. Our pickings increased until it was necessary to have more

sweating accommodation. Not being satisfied with all conditions, and believing that improvement was soon at hand, we decided not to build just then, so we moved out into our regular storing tents, using the kerosene stoves for heat in the same way, only more of them were required considering temperature only.

"Having more room and fruit, it was necessary to have more stoves. The old Perfection B had had its day, and the new Perfection taken its place, consequently we purchased new Perfection. We soon discovered the new stove did not colour the fruit. It gave off the same amount of heat, also evaporated the same amount of water, was much nicer to manipulate, but decidedly slower to colour. Very often we were required to make a change, taking out the new stoves and replacing them with the old in order to complete the job. The old stoves threw off a large column of pungent gas. This being the only difference we could see, led us to believe that there was some virtue in the pungent gas. We also discovered that we could shorten the time of colouring in tents by making them two thicknesses, placing one over the other, thus more closely confining this pungent gas.

"We carried on a few small experiments at this time which served to strengthen our opinion that this pungent gas was an important factor in colouring oranges and lemons.

"While sweating in the room and tents, the stoves were on the same floor with the fruit. This had several objectionable features, namely, the fruit would not colour in the bottom box as soon as in the top. They had to be turned out, and removed every time we trucked fruit out. This was dangerous, as the stoves were liable to be struck with the trucks, causing leaks or fire.

"Feeling the need of better accommodation, and having in mind all the points we had picked up from past experience, both good and bad, we planned to build a new sweat-house, one that would cover all the good points and overcome the objectionable ones. We also decided to build as nearly fireproof as possible, independent of the main building, and thus eliminate the danger of fire, especially to the main building. We at this time had the good fortune of having an assistant to help plan and build such a sweat-house, this party having had successful experience in firing from the basement. The basement idea would overcome the objectionable feature of having the stoves on the same floor.

Description of the Sweat-house.

"We first staked out a piece of ground, 42 feet by 46 feet, inside measurement, being sufficient for six rooms 14 by 20. We excavated for each room, making a basement 12 feet by 18 feet at top, allowing it to taper at about 45 degrees, 6 feet in depth, which gave us 5 feet by 8 feet 6 inches at the bottom for stove floor. The tapering wall prevented it from crumbling, and gave sufficient strength to carry foundation and partition walls. We excavated an aisle, 4 feet 6 inches, tapering to 3 feet at the bottom, and running

lengthways of the building. There are three rooms on each side of the aisle with doors entering from the aisle, which enables us to go into the several rooms independent of each other.

"Water is piped to each room. There is electric wiring in conduit throughout the building. Also, allow me to mention, in passing, that two fire escapes have been wisely provided, in addition to the main stairway, making a total of three possible ways for a man to escape in case of fire.

"Now we come to the upper rooms. The main outside walls are of concrete, 6 inches thick, 8 feet high, with a small window in each room. The ceilings and partitions are of 1-inch tongued and grooved redwood. A 6-foot aisle runs lengthways of the building, with doors the full width of the aisle at each end. There are three rooms 14 feet by 20 feet on each side of the aisle, each room independent of the other. The floor is made of 2 in. x 6 in. Oregon pine, laid with ½-inch openings between each, affording ample room for the heat and gas to come through. The gables are ceiled with 1-inch rough Oregon pine, covered on the outside with sheet-iron. There are three doors in each gable, which allow a large per cent. of natural heat to escape. They are so arranged that by pulling a small cable in or out of sweat-house they can be unlatched, closed, and latched. This was provided so that in case of fire they can be quickly shut, which would protect the sweat-house from any outside fire. In case of the fire starting in the sweat-house, this would confine it to same, and protect the outside buildings. The roof is of galvanized sheet-iron, with vent in top. This vent can also be closed by pulling a small cable.

"There is a 5 feet by 8 feet galvanized sheet-iron secured to the upper and under the main floor over the burners in the basement, to prevent flames or the heat coming direct on the fruit, in case we are not using vessels on the stoves.

"Now for the colouring of the fruit. We find we have better results by treating oranges and lemons differently. I will speak of the oranges first. The green and yellow are separated at the washer, placed in packing-cases stacked eight high, the fruit in the top case being covered with paper. The fruit is then trucked into the sweat-room, trucking the dark green in first and placing it farthest from the door. The rooms being 14 by 20 afford ample room for one car, or 600 packing-cases to each room. The boxes stacked eight high prevent re-stacking in the sweat-room. The fruit is trucked five rows in each room, 120 boxes to a row, and 5 inches space between each row, thus allowing room for the removal of the clamp trucks. The fruit is set in with a small space left between each stack, say 1 to 1½ inches, which is ample room for the heat and gas to equally distribute itself. Having the stoves down in the basement makes it possible to truck fruit in and out of sweat-room without disturbing same. They are low enough to afford uniform colouring top and bottom, holding the temperature of the room at about 100 degrees as nearly as possible, 100 degrees being the maximum. Moisture is used sparingly. We have not been able to secure a hygrometer that will give us sufficient accuracy in the sweat-room to be able to establish a fixed

humidity, so we are compelled to go by observation. We supply our moisture from evaporation, using just enough to keep the fruit from wilting, and watching that there are no beads of water collecting on the fruit or ceiling, working for reddish orange colour. The colour is improved by quick action, firing continually until well coloured.

"Now, the sweating of lemons. You will note the difference in temperature, humidity, and time allowed to colour. If the sweat-room has stood with long intervals between usage, we go into the room, thoroughly wetting the walls, ceiling, and floor before we allow any fruit to go in. First washing the fruit, we divide the green fruit into three or more shades—dark green, light dark green, dark light green, and light green. We think it is impossible to put too much care upon this important position at the washer, consequently we see that there is a competent hand at this place. If this classifying is well done, the fruit can be handled in such a way as to receive the best results from the room.

"I might say here that at this time of year, or when we are getting a per cent. of the new crop, and a small per cent. of the heavy dark green is rough and coarse, if it is stored elsewhere for about ten days before going into the sweat, it will improve both in colour and quality.

"The lemons are trucked into sweat-room from washer, trucking in the dark shades first, lighter shades next, and working the lighter shades to the door, as the light green colours should come out first, thus allowing the fruit to be uniformly coloured. We find a difference of twelve to twenty-four hours in the time required to colour the different shades. In firing from the basement we endeavour to produce all the gas we can, paying close attention to the temperature, and holding it as nearly as possible to 90 degrees, this being the maximum. Lemons require much more moisture than oranges, and should have a sufficient amount not only to prevent wilting, but to prevent the heat from baking the colour to a ripish or dark yellow. In lemons we work at all times for a *whitish yellow*. The humidity can vary to quite an extent before there is too much, but I am unable to say just what per cent. But to speak again from observation, there must be beads collecting on the ceiling and fruit. This moisture is supplied by evaporation. Occasionally we have a room of fruit that drinks up all the moisture we can supply by previous sprinkling and evaporation. When this condition presents itself, we attach the hose to the hydrants in the basement and wet the fruit down, soaking everything in the room. We also go down in the basement and sprinkle the walls heavily.

"A much better colour is secured if more time is given to the sweating, say firing at intervals instead of firing continually.

"We have carried on various experiments, working with hopes that we could discover a way by which lemons could be quickly coloured and retain their buttons. Results of our work so far have proved that this combination cannot be accomplished, but can be done separately. The buttons will not drop off if much more than the ordinary time is given to colour. Our experiments served to strengthen our conclusion that the pungent gas was

the prime factor in colouring the fruit, also was the whole factor in throwing the buttons, while, as I have said, if a small quantity of gas is put to the fruit it will colour it in time and not throw all the buttons, but a large volume of gas will hasten the colour but throw the buttons, very often before the fruit commences to colour.

"It will be the pleasure of the Bureau of Plant Industry to hand out a circular giving the particulars of all experiments and results carried on during two seasons while here. This will be done in time. I wish to say that we carried on sufficient experiments to place us in a position where we could see that we were in a large field—room for difference of opinion under the same conditions. The cause underlying this great difference is not fully understood at present, but the results of the experiments so far invite a more interesting study of the sweat-room.

"In closing, I will say that I believe the time is near at hand when we will be able to generate our gases for a large amount of fruit from a small amount of fuel, thus reducing the cost of labour, cost of fuel, and last, but not least, reduce the great danger of loss by fire."

The time is not far distant when our citrus growers will have to adopt this very simple method, and by a system of co-operation, one or two rooms could be fitted up in the main fruit-growing centres, where one man could take charge of the work during the season or seasons when it might be found necessary to colour either green matured oranges or lemons. I am hoping to be able to carry on an experiment at Pera Bore during the coming fruit season, as a good many of our Late Valencias which are budded on lemon stock turn a green colour before we are ready to harvest them. The Late Valencias growing on the orange stock do not turn nearly so green nor as early as do oranges on trees worked on lemon stock.

"Agricultural Journal of the Union of South Africa."

The recently formed Union of South Africa, unlike the Commonweath of Australia, embraces a Federal Department of Agriculture, and the *Agricultural Journal* has been instituted to take the place of the several provincial journals. It is published monthly in English and Dutch, the subscription being 2s. per annum within the Union, and 5s. per annum to persons residing outside. The first issue, February, 1911, has been compiled somewhat hurriedly, and mostly comprises matter contributed to the late *Transvaal Agricultural Journal* which was at hand in Pretoria.

The *Gazette* wishes the new journal every success, and we shall from time to time give our readers the benefit of notes from our contemporary which appear applicable to New South Wales conditions.

New Apples.

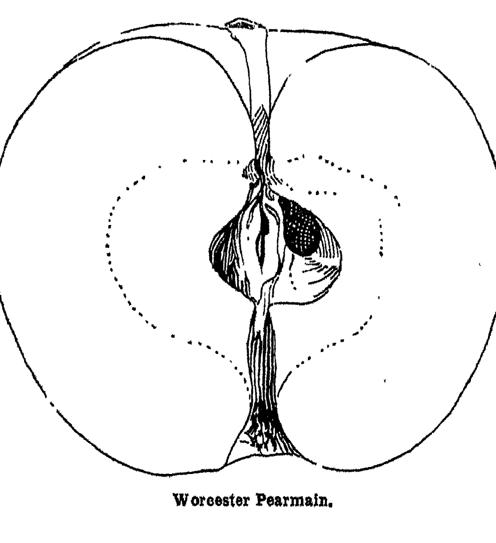
W. J. ALLEN.

THE coloured plate herewith has been prepared by Mr. Grosse from specimens of two apples, which show considerable promise in the orchard attached to Bathurst Experiment Farm.

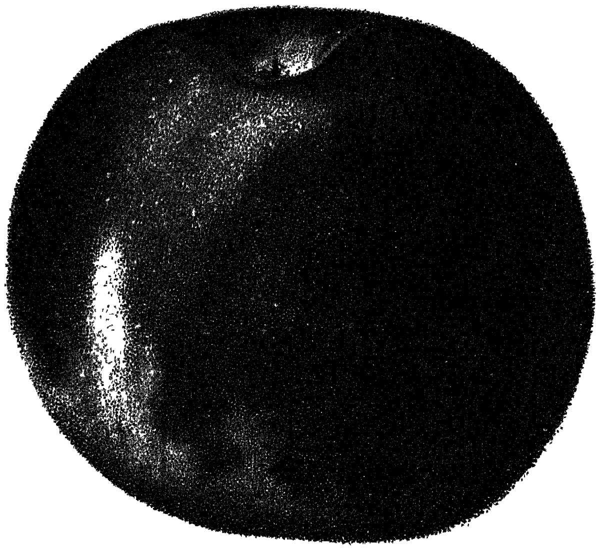
1. Worcester Pearmain.

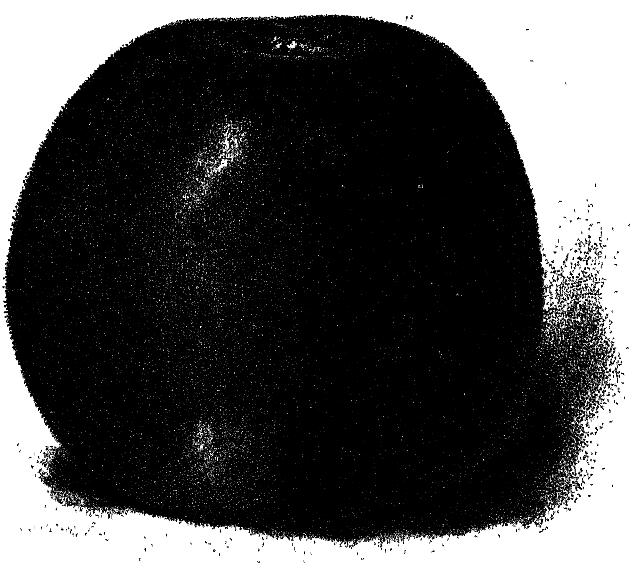
This apple is proving one of the best early-maturing varieties at the Farm orchard.

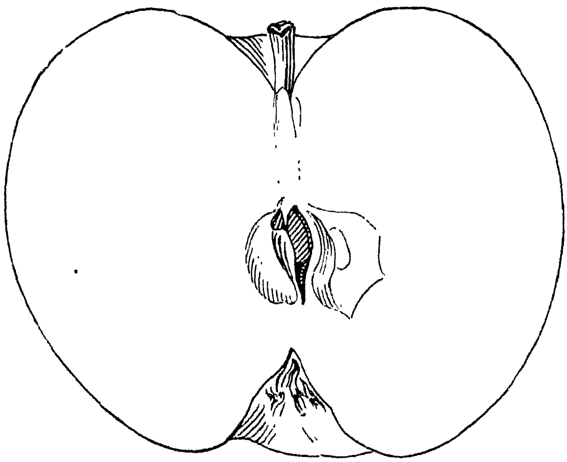
Date of Blossoming.—From 12 October, 1908.
Tree.—Habit of growth : moderately vigorous, fairly spreading.
Age of Tree.—Five years.
Fruit.—Form : oblate, conical, angular.
Size.—Medium.
Colour.—Green, nearly covered with a dark red, obscurely striped, and some light dots.
Cavity.—Wide, with green russet.
Stem.—Short and thick.
Basin.—Shallow.
Eye.—Erect, closed.
Flesh Texture.—Medium.
Flesh Colour.—White.
Flavour.—Good.
Dessert.—Good.
Date of Ripening.—30 January, 1908.
Date of Picking.—28 January, 1908.
REMARKS. Fair cropper. Went sleepy in store-room by 8 February, 1908.



Worcester Pearmain.







McIntosh Red.

2. McIntosh Red.

This is a very good apple, and sells well, and we can recommend that it be grown for a medium early dessert.

Date of Blossoming.—29 September, 1908.
Tree.—Habit of growth: very vigorous.
Age of Tree.—Six years.
Fruit.—Form: roundish oblate.
Size.—Large.
Colour.—Whitish yellow, crimson, blush.
Skin.—Thick.
Cavity.—Deep.
Stem.—Short and thick.
Basin.—Narrow and abrupt.
Eye.—Closed.
Flesh Texture.—Fine.
Flesh Colour.—White.
Flavour.—Good.
Date of Ripening.—13 March, 1909.

Killing Buffalo Grass.

A correspondent on the South Coast asks for a method of killing buffalo grass. This grass can be killed by ploughing up in the winter and exposing the roots; then when the roots have become fairly dry, plough the tussocks well under.

Another method is to spray or water with arsenite of soda at the rate of 1 lb. of the chemical to 10 gallons of water. Care must be taken in using this solution to see that live stock are not allowed to graze where it has been applied until the poison is washed off. This is a very effective method of eradicating small areas.—G. Valder.

Boys' Corn Clubs.

Farmers' Bulletin No. 422 of the United States Department of Agriculture, contains a picture of a little Yankee, about 10 years of age, in overalls, standing with arms akimbo in a patch of corn three times his height, his own raising. The "Boys' Corn Clubs" have been systematised by the Federal Department. Each boy enrolled works a definite piece of ground under definite instructions that will give him a knowledge of how to work large crops. School teachers, business men, newspapers, and parents all give aid and support. The boys are not rewarded solely by the crops. Public-spirited men give numerous and valuable prizes. The members of the Club who raise the largest crop in their State, receive a free trip to Washington and a stay of one week there free of expense. The boys who won the trip in 1909 were presented with a diploma by the Secretary of Agriculture.

The boys apparently are taught the best methods of cultivation, and particularly the selection of seed. In Holmes county, Mississippi, in 1909, the Boys' Corn Clubs produced crops averaging 76 bushels per acre. The corn grown by their fathers and the neighbours averaged about 16 bushels. This roused Mississippi and the other corn States, and the enrolment of the clubs jumped from 10,543 boys in 1909 to 46,225 in 1910.

In some of the agricultural districts of this State where school gardens are established, similar competitions might be organised. The staple crop of the district is the best to work upon—wheat, maize, potatoes, or whatever it be. Let one of our persuasive schoolmasters approach the parents to give their boys an acre each; let him study up the soil and the crop, if he has not already done so, and instruct the boys. Get some prominent business man to offer a prize for the best crop. The results will probably stagger the parents in many places, and the movement should spread like a bush-fire.

"Running out" of Potato Seed.

Some experiments conducted by the Agricultural Experiment Station of Minnesota University last year were designed to compare the yields from new potato seed stock with yields from stock grown on the station. Fourteen varieties of potatoes were used. The "old stock" had been grown on the station for periods ranging from one to twelve years. The "new stock," which was planted alongside, was obtained, wherever practicable, from the firm that supplied the old stock. The result was an average gain of 112·8 bushels of marketable tubers per acre in favour of the "new stock." There was a difference of from one to twelve years between the old and the new stock, the average being 4·2 years. The gain in yield in favour of the new stock increased rapidly with the years of difference.

In the Annual Report of the Station for 1910, the following recommendations are made as the result of these trials:—

> Every potato-grower should try on a small scale, new seed stock of the variety that suits him best. If he buys new seed stock locally, it is desirable that it should come from a different type of soil. New seed stock from the same type of soil may, however, often result in much improvement, if the stock obtained has been better grown and is more vigorous than one's own. It would be advisable to try new stock from some other sections of the country, as well as from local territory. The aim should be to secure short, thick, smooth tubers with a minimum of the rough or elongated and run-out types. Unless the old stock on hand is very badly run down, it would seldom be advisable to go to the expense of getting enough new stock for the entire crop.

Horse-shoeing.

(Continued from page 244.)

T. G. PALGRAVE, M.R.C.V.S., Government Veterinary Surgeon.

THE stock saying, "Make the shoe to fit the foot, instead of the foot to fit the shoe," while apparently an excellent precept, is one of the many half-truths which appeal to those whose knowledge of a subject is not as full as it might be. While freely admitting that, as a choice of two evils, fitting the shoe to the foot is the lesser, any experienced horse-shoer knows that *the shoe and foot must be fitted to each other*; and to attempt to obtain a proper fit and level bearing without preparing both foot and shoe to accommodate each other is attempting the impracticable.

Preparing the Foot.

In preparing the foot for shoeing, a good level bearing surface must be the first object aimed at; it should be even, on sound horn, and as wide as possible, in order to give stability to the shoe.

To prepare the foot, remove all superfluous horn around the wall of the foot—*i.e.*, that at the lower edge of the hoof—with the *rasp*, being careful not to shorten toe or heels unduly. This superfluous horn being removed *by the rasp*, the knife may then be used to finish off the lower surface of the wall and to remove any small prominences of horn.

The sole and frog should not be pared away with the knife. Any loose flakes of horn attached to either can be removed by means of the buffer, and the knife then used for such trimming as may be required. The practice of cutting away large slices of the frog, opening the heels widely, and paring away the sole till it is concave in shape, cannot be too strongly condemned. Cutting away the frog reduces the extent of what may be called a natural anti-concussion pad, and nothing is gained but much is lost by such a practice. Paring away the sole removes the supporting horn within the borders of the wall, thereby leaving a narrow ridge to which to attach the shoe, instead of a strong flat surface. The thinning of the sole is also conducive to easy bruising of the sensitive portion of the foot protected by it. Opening the heels to excess means an unnecessary removal of horn, thereby weakening the foot and reducing the available bearing surface for the shoe. The longer the bearing surface at the heels, the more is the weight-sustaining base brought under the leg, and the better is the position for supporting the body of the horse.

Over-reduction of horn is always a grave error, as when horn is strong and the hoof capable of sustaining pressure at each part of it that comes in

contact with the ground, then weight is evenly distributed; but if, on the other hand, the horn is thin at any point, then that part is liable to yield to pressure, the distribution of weight tends to become unequal, and lameness frequently results.

The angle of horn contained between the wall and bar may require a little attention, as this portion of the sole should not be allowed to come in contact with the shoe. A little careful paring down will reduce the horn at this point sufficiently to obviate any chance of contact between horn and shoe; but the horn must not be *dug* out—as is done so frequently—till this portion of the sole looks as though well-sinking had been attempted there.

The bearing surface for the shoe should be as long and wide as possible. If, without undue removal of the horn of the wall by the rasp, a firm portion of the sole can be obtained continuous with the lower surface of the wall, the best possible bearing surface has been secured. Diseased or broken horn should not form part of the bearing surface. Either should be carefully removed, or, if this cannot be done, the edge of the broken or diseased horn should be so cut or rasped away as to prevent actual contact with the shoe.

When a good level bearing surface has been obtained, the sharp outer edge of the wall may have the fine edge of the rasp—which edge is specially suited for this purpose—run round it, as such light rasping reduces any tendency of the horn to split, by removing the sharp thin edge.

Rasping.

An uneven bearing surface is often the result of careless rasping—one side of the wall may be rendered lower, or one heel may be left higher, than the other; or, again, one side of the toe may be over-reduced. The parts which are most liable to be over-reduced are generally those which are most easily reached by the rasp. A heel which has been rasped down too much is bad, as the wall at that point is left lower than the sole within it, the shoe rests entirely upon that portion of the sole instead of on the wall, and a bruised heel is frequently the result. If one side of the wall is lowered more than the other, the whole of the foot rests unevenly upon the ground; and if the toe has been shortened by rasping away the horn in front of it, instead of reducing the ground surface of the wall, a "stumped-up" toe is the consequence. This is a very unsightly condition, and weakens the front of the hoof.

Excessive rasping of the outside wall of the hoof must always be avoided; in fact it is safe to say that the only need of the rasp in this connection is to lay the clinches flat. Rasping the outside of the hoof destroys the tough protective outer layer of horn; evaporation is thus favoured, and the toughness, which is such a desirable quality, is replaced by a hard and brittle condition. Rasping such as this is particularly harmful between the shoe and the clinches, as this portion of the horn requires to be specially tough, in order to bear the contact of the shoe and the perforation of its substance by the nails.

Types of Shoes.

The choice of shoes is a point of great interest, as no matter how expert the workman may be, an unsuitable shoe can never be anything but a failure, however well it may be forged. The type of shoe required necessarily depends on the class of horse for which it is to be used, and also on the condition of the foot, namely, whether sound, diseased, normal in shape or abnormal. There are, however, a few points regarding all shoes which will pay for observance :—

(*a*) A thick shoe raises the foot from the ground unnecessarily.

(*b*) A very heavy shoe imposes extra work on the horse, and when he is tired is a common cause of stumbling.

(*c*) Shoes should always be of good width, narrowing towards the heels, and the heels and toe should always be of the same thickness.

(*d*) The heels should be flat, so as to obtain a firm bearing, in all shoes except those in which calkins or cogs are required.

Seated shoes, that is shoes with a portion of the foot-surface* dished out, limit the bearing to the wall, as the dished out surface does not permit of the sole resting upon it. A shoe of this type does not distribute body weight as it should be distributed, and, moreover, stones and dirt of all kinds are very prone to become fixed between the seated portion of the shoe and the sole.

A foot-surface which is sometimes forged is one sloping downwards and inwards from the outer edge of the shoe. This is very bad, as at each step, when the weight of the body is thrown on the foot, the hoof is compressed owing to the saucer-shaped bearing.

It may, therefore, be taken as a general guide, that the only occasions on which it is necessary to dish out any part of the bearing surface of the shoe

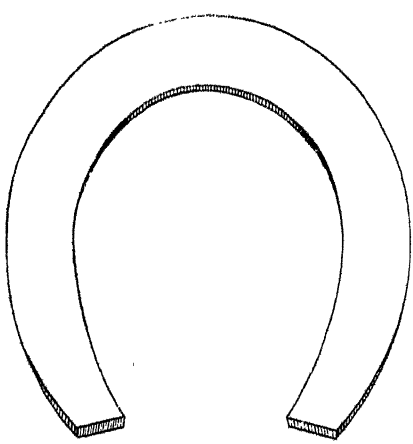


Fig. 9.—Level flat bearing surface.

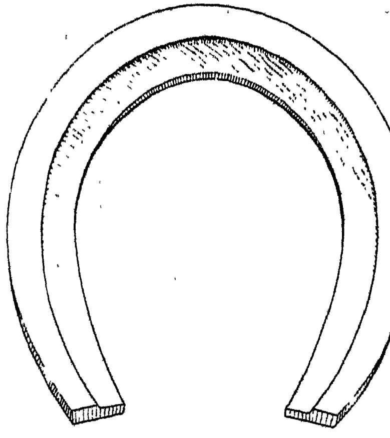


Fig. 10.—"Seated" bearing surface.

* The surface of the shoe which rests upon the foot

is when the horse has a "dropped sole," namely, a sole which is abnormally convex as the result of disease or injury, or when it is advisable to relieve the pressure upon the portion of the sole next the wall.

Fig. 9 shows a shoe with a flat bearing surface, and Fig. 10 one with a seated bearing surface.

The ground-surface of the shoe (the surface of the shoe which comes in contact with the ground) may be fullered or plain.

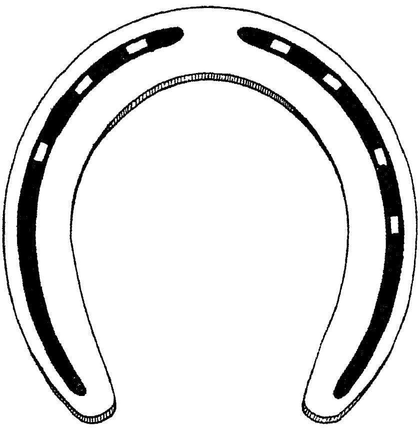


Fig. 11.—Fullered Shoe with Plain Toe (showing ground surface).

A fullered shoe is one in which a groove runs either all round the surface of the shoe, or is confined to the region of the nail-holes, leaving the toe and heel plain, or leaving the toe alone plain. (Fig. 11.) In some cases a double fullering is forged, the inner groove lying towards the inner edge of the web of the shoe, and being without nail-holes. This pattern is known as a "Rodway" shoe. It is supposed to prevent slipping, and has some effect in that respect, but it is only suitable for light horses.

The "Charlier" shoe was greatly talked of at one time, but has never made much headway. This shoe is applied by cutting away a small strip of the lower border of the wall, thereby forming a groove, and fitting in place of the removed horn a thin narrow shoe. Fig. 12 shows a foot prepared for a Charlier shoe. This form of shoe is difficult to fit, and the advantages claimed for it are more than balanced by its obvious defects. Theoretically it was supposed to prevent undue wear of the wall, while leaving sole, frog, and bars in direct contact with the ground; all of which would be most desirable could they be obtained without accompanying drawbacks. When it is remembered that the wall is *not the only* bearing surface, but that this function should be shared by the portion of the sole which joins the wall, one of the drawbacks of the Charlier method of shoeing becomes apparent, as the shoe does not rest on the part of the sole referred to. Further disadvantages are that by being "let in" to the hoof as it is, the

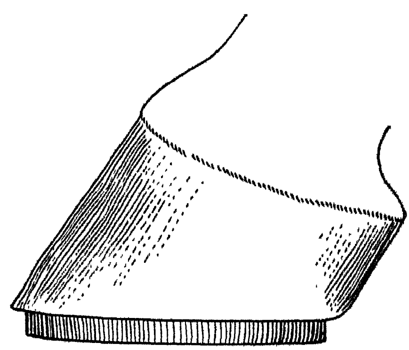


Fig. 12.—Hoof grooved, ready for fitting a "Charlier" Shoe.

risk of undue pressure by it on the sensitive underlying structures is great; and, owing to its narrowness, its bearing surface is very limited, and very "fine" nailing is required to fasten it. (What is meant by "fine" and "coarse" nailing will be dealt with later.) It is claimed for the Charlier shoe that it is useful in some cases of "brushing" and "speedy-cutting." These claims may be well founded.

A shoe known as the "patten shoe" (Fig. 13) is used in some cases of lameness, when it is required to raise the heel and relax the "back tendons." The advantage this shoe possesses over ordinary calkins is, that the turned-up portion is not as likely to sink into soft ground as are calkins.

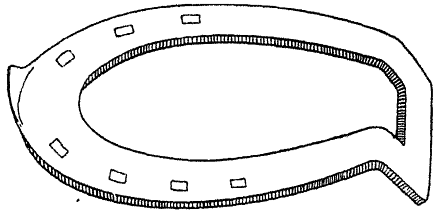


Fig. 13.—"Patten" Shoe.

Fullering.

Plain shoes, the nail-holes of which are not in a fullering, but are pierced through the thickness of the web, are called "stamped shoes," and such nail-holes are sometimes described as "countersunk." The advantages of fullered shoes are, that they afford a better grip of the ground, and that the head of the nail when driven home into the groove is not as much exposed to wear as it is in the case of a plain shoe.

The fullering should be both wide, so as to allow of proper direction being given to the nail, and deep, in order to let the nail-head well down. A narrow fullering renders it very difficult to give the proper inclination to the nail, and to drive it home securely. Should the inclination be wrong, the nail either fails to get a sufficient grip of the horn when directed outwards, or pricks the sensitive foot when directed inwards. If the nail is not driven well home before being clinched, the clinch is apt to work loose.

Generally speaking, the shoes which give the best results are those which are single-fullered (*i.e.*, with one groove) in the region of the nail-holes, and have plain toes and heels. In these shoes the solid portions—toes and heels—come where the wear is greatest, while the shoe possesses all the advantages derived from fullering.

Weight of Shoes.

The lighter a shoe is, compatible with the required strength, the better. The rapidity with which a shoe wears out depends more on its make than its weight. Only practical experience can teach how to forge a shoe so as to obtain the maximum of wear and the minimum of weight, especially as it is most unlikely that two horses of the same class, doing the same amount and kind of work, on the same roads, and shod with exactly similar shoes, will wear their shoes to the same extent. To attempt to lay down any hard and fast rule how to obtain the required results in wear and weight of shoes would be not only useless but misleading. Heavy shoes tend to tire a

horse, and a tired horse will wear his shoes more than a fresh one. Continual slipping on paved streets will wear shoes out of all proportion to the amount of work done.

The width of a shoe may vary with advantage; it should be widest at the toe and narrowest at the heels. A wide toe gives a good bearing surface, and if the heels are somewhat narrowed they will not encroach on the frog.

Heel and toe should always be of the same thickness, so as to ensure a level bearing. A thick toe has a tendency to strain the "back tendons," while a thick heel is apt to straighten the pastern unduly.

For general purposes the following weights of shoes may be taken as a fair average:—

	Per set.
Racing plates	½ lb. to 1 lb.
Racing shoes	1¼ lb. to 1½ lb.
Hackneys	2 lb. to 4 lb.
Carriage and light van	5 lb. to 6 lb.
Van	7 lb. to 8 lb.
Heavy draught	10 lb. to 12 lb.

Aluminium racing shoes would, of course, weigh far less than shoes of other metal.

Special Forms of Shoes.

Other forms of shoes are the bar-shoe (Fig. 14), the tip (Fig. 15), a special shoe with heel-clips for sand-crack (Fig. 16), and the shoe with a concave ground surface (Fig. 17).

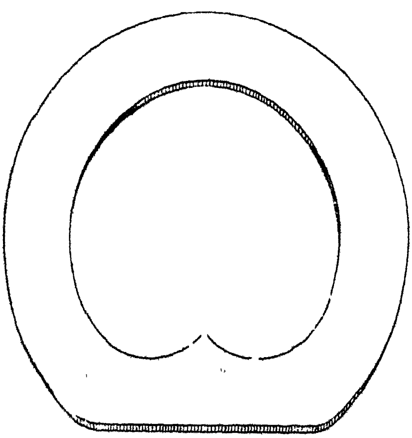


Fig. 14.—"Bar" Shoe.

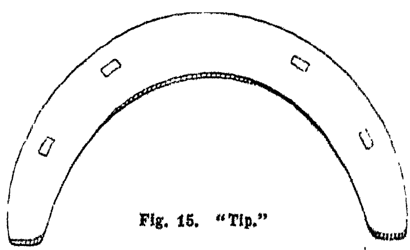


Fig. 15. "Tip."

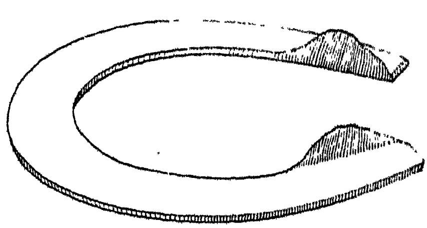


Fig. 16.—Shoe with inside heel clips for Sand-crack.

"Fine" nailing is when the nails are driven too near the outer surface of the wall; "coarse" nailing is when the nails are driven too close to the sensitive foot. Fig. 18 shows nail-holes placed too coarsely; in Fig. 19 they are

placed too finely. In "fine" nailing, the nail is liable to split the wall of the hoof, and it must be driven very high in order to obtain sufficient grip ; in coarse nailing the proximity of the nail to the sensitive structures of the foot is apt to cause lameness by its pressure, even if the foot is not actually pricked.

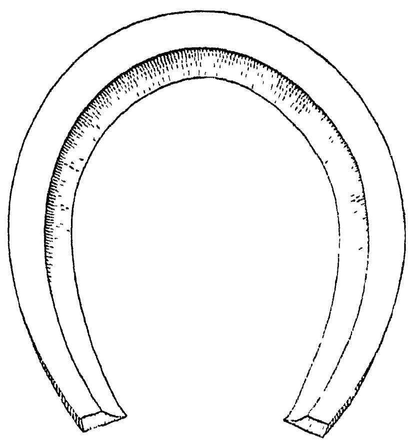


Fig. 17.—Concave Shoe (showing ground surface).

"Calkins" are turned up pieces on the heels of the shoe (Fig. 21), and are often of service in the case of heavy draught horses pulling big loads on hilly and badly-paved streets. They often contribute to straining the tendons which lie in front of the shin, owing to their raising the heels, and they also relax the back tendons. When it is necessary to use them, the low square pattern is the best.

"Toe-pieces" are square pieces of iron welded across the toes of the shoes (Fig. 21). They are used for the same purpose as calkins, and have the

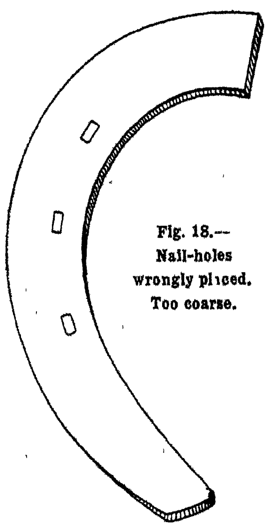


Fig. 18.—Nail-holes wrongly placed. Too coarse.

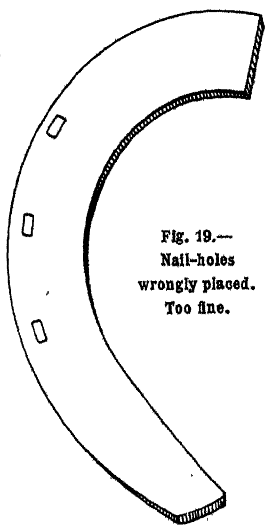


Fig. 19.—Nail-holes wrongly placed. Too fine.

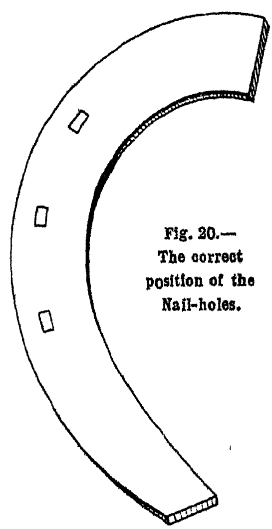


Fig. 20.—The correct position of the Nail-holes.

same drawbacks, except that the action on the tendons is reversed, those in front being relaxed whilst those on the back of the leg are strained. Both calkins and toe-pieces, when used separately, cause unequal distribution of weight, and when adopted at all are best used together. Toe-pieces and calkins add materially to the weight of the shoes.

The "toe-clip" often induces "seedy-toe" in feet which are predisposed thereto, owing to the pressure it causes on the part. If the shoe slips on the foot, as old and worn shoes often do, the clip is then liable to penetrate the sole; and in a worn shoe the clip is apt to separate from the wall, in which case its sharp edge is liable to cut the opposite limb, or the hind clip may cut the foreleg.

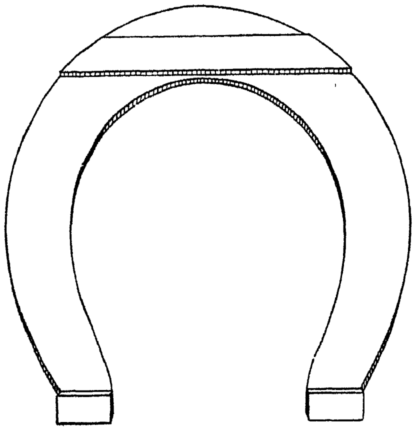


Fig. 21.—Shoe with calkins and toe-piece (showing ground surface).

"Cogs" are only used in frosty weather.

Springing the heels of a shoe, namely, leaving a space between the heel and the bearing surface of the shoe, is a most objectionable practice and one that cannot be too strongly condemned. It is supposed to take pressure off the heels, but really does quite the opposite. It must surely be apparent that, when the foot comes to the ground and the whole weight of the limb rests on it, the heels will come down on the shoe with the weight of the leg driving them, and thus must be jarred and cannot escape pressure, while the fact that they descend upon the shoe in spite of the space left, makes it plain that in such descent the portion of the foot against which the rest of the shoe is closely nailed must receive a severe wrench. Nor does the evil end here, as such constant wrenching tends to loosen the remainder of the shoe from its attachments.

If it is desired to remove pressure from the seat of corn, a "bar-shoe," that is, one with the heels joined by a bar of iron of the same thickness as the shoe, will serve the purpose, as the bar throws the pressure on to the frog and thus relieves the seat of corn. The same purpose is served by a three-quarter shoe, namely, one with about an inch and a half of the heel cut away; but the bar shoe is preferable, as it secures even wear of the hoof, which is obviously not the case with the three-quarter shoe.

The heel of the shoe should be exactly the same length as the heel of the foot, and should be rounded off flush with it to reduce the chance of the elbow becoming "capped" by pressure of the heel when the horse is lying down. Short heels press too much upon that part of the hoof where they terminate, while long projecting heels are liable to be trodden on and the shoe torn off. The same remark applies to shoes that are fitted too "wide," *i.e.*, project beyond the side of the hoof.

Rubber pads (Fig. 22) are useful on city streets, as they give increased foothold and diminish concussion, besides exerting increased pressure on the frog. Leathers are useful when the sole has been much thinned, either owing to bad workmanship with the drawing knife, or surgically on account of

disease. They keep the sole clean, and a surgical dressing can be packed between the leather and the sole. They minimise the risk of bruising, and to some extent reduce concussion. The latter result can be obtained by having a rim of leather the same width as the shoe fitted between shoe and foot. A great advantage of this method is that it allows the sole and frog to be cleaned out daily.

Shoeing in Abnormal Cases.

In shoeing *flat feet*, use a concave shoe, and on no account pare down the sole. The foot-surface of such a shoe should be *moderately* seated (Fig. 2), and the bearing should rest upon the whole of the wall, and only just reach the outer edge of the sole.

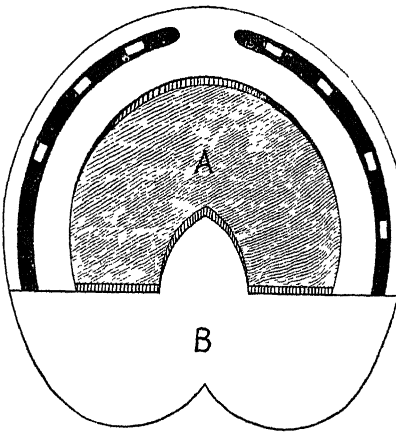


Fig. 22.—Bar-pad and leather with shoe. A, leather; B, rubber-pad.

The heels of such a shoe should be *exactly* the length of the foot, and the *bearing surface* rather narrow and quite flat.

For *contracted feet*, a properly fitted tip is the best form of foot-covering, as it allows of ample frog pressure and heel expansion. A tip is a short shoe extending over only the front half of the foot.

For *speedy-cutting*, shoe "close" on the inside of the striking foot and keep the heel low. By close-shoeing is meant bringing the edge of the shoe just within the edge of the wall on the inner side of the hoof. This form of shoeing is not a particularly desirable one, but it must occasionally be resorted to in cases of speedy-cutting, in which the alternative method of shoeing with a three-quarter shoe has proved inadvisable.

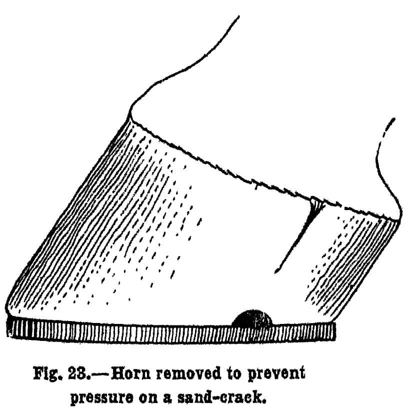


Fig. 23.—Horn removed to prevent pressure on a sand-crack.

In cases of *sand-crack*, avoid placing direct pressure on the part of the hoof in which the sand-crack is located. This can be effected by removing a small portion of the horn of the wall at its lower edge immediately below the sand-crack, so that the hoof at this point does not rest upon the shoe (Fig. 23). Calkins, or high heels, should never be used in cases of sand-crack, neither should a clip be drawn immediately over, or below, the crack. A very useful shoe in a case of this sort is one with a clip drawn at the *inside* border of

each heel, and so fitted that the clips rest on the *inside* of *each bar*. These clips prevent the heels closing when the foot touches the ground, as they hold the bars apart, and, as a consequence, the crack is not so likely to be forced open by the closing of the heels, as is otherwise the case.

For *brushing*, a "knocked-up," or, as it is sometimes called, a "feather-edged" shoe, is a great favourite with some shoers. This shoe is fitted very close, and the inner border of the wall of the hoof is rasped off flush with the shoe. It is open to question whether these shoes are beneficial, but there is no doubt as to the harm caused by them; the bearing surface of the inner half of the shoe is largely reduced, a great part of the inner wall rests on what might almost be called a knife edge, which is certain to exercise a harmful effect on the wall; and the weight is very unevenly distributed. The best shoe for a brushing horse is a light shoe without calkins, and with a good level bearing surface.

In *over-reaching*, all that is required is to round off the inside lower border of the offending hind shoe from one heel to the other, so as to remove the sharp edge. When a horse over-reaches he strikes the heel of the forefoot with the inside edge of the hind shoe on the same side, generally near the toe. If the whole of the inside edge is rounded off for the whole length of the shoe, the danger of over-reaching is greatly minimised or done away with altogether.

Forging is the noise caused by the toe of the hind shoe striking the inner border of the fore shoe corresponding to it. If the inner border of the fore shoe is rounded off all round the shoe, the noise is greatly lessened, even though it may not cease altogether. The diamond-toed shoe, which is so often recommended, is a most pernicious invention. It certainly does away with the *noise* of forging, but the diamond toe *strikes the sole of the forefoot instead of the inner border of its shoe*, thus causing bruising of the sole and its accompanying evils—a far worse matter than the mere noise. This type of shoe is a good specimen of a remedy that is worse than the disease which is it erroneously supposed to cure, as the first and last objection to forging is the noise made.

No shoe must be applied to the foot when very hot, as by doing so the hoof may easily be severely burned. This is occasionally done by a careless smith. As cold fitting of shoes is not practised under ordinary conditions, it is not a subject to be dealt with in an article such as this, which has only touched very briefly on the most elementary points of this most important and interesting subject.

Blacksmithing for Farmers.

(Continued from page 235.)

A. H. E. McDONALD (late Instructor in Agriculture, Hawkesbury Agricultural College.*)

HORSE-SHOEING.

HORSE-SHOEING, or farriery, is a special industry, practiced by a large number of men. Generally, it is carried on in conjunction with other classes of blacksmithing, but in some shops nothing but shoeing is done. It is taught at most of the veterinary schools, but those who are engaged in its practice have, as a rule, acquired their knowledge by serving a period of apprenticeship with men who have become fitted in a like manner.

Fig. 1.—Removing the Shoe. Knocking out the Clinches.

Formerly horses were almost entirely shod by professional farriers, but of late years many horse-owners have learnt to do their own shoeing. This has been encouraged by the introduction of manufactured shoes ready for fitting. While shoes were forged by smiths, the trade could be kept in their own hands, but since shoes have been obtainable on the market a portion of the business has been lost to the tradesmen.

* Now Inspector of Agriculture, North-west District.

Such shoes are of two classes—machine-made and hand-made. It is generally admitted that, as a rule, they do not wear quite so well as the shoes forged by the farrier, but the saving effected in both time and money more than compensates for this. Frequently the horseman lives far from the farrier, and if the horse has to be taken such a distance over hard roads without shoes some injury to the hoofs is likely to result.

Provided the structure of the horse's hoof is understood, shoeing is not a difficult task. The operations can be summarised as follows:—

1. The removal of old shoes and nails.
2. The preparation of the hoof by paring and rasping.
3. The fitting of the shoe.
4. Nailing and clinching.
5. Finishing off the shod hoof.

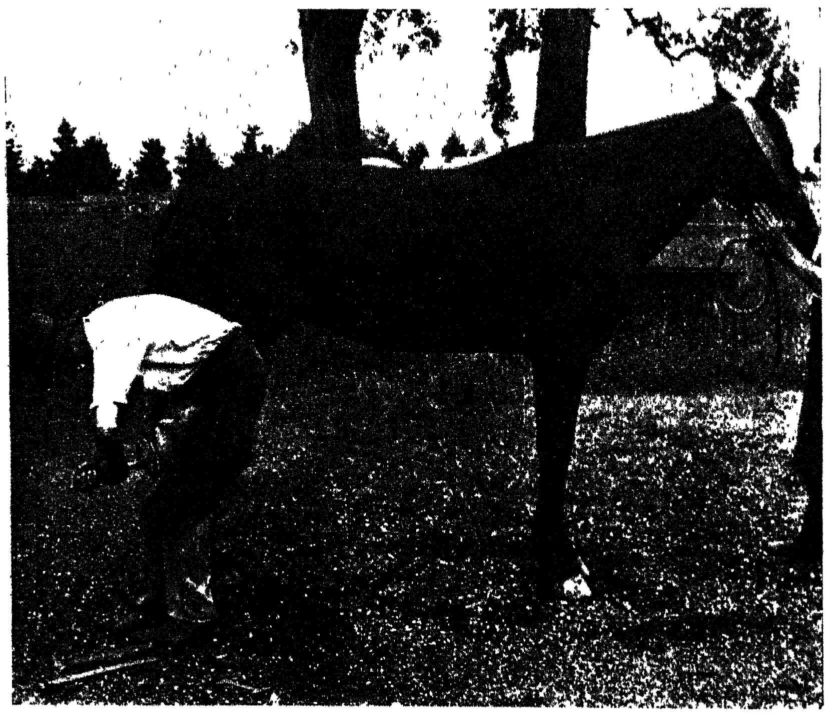


Fig. 2.—Removing the Shoe with the Pincers after the Clinches have been knocked out.

A description of the horse's foot is given by Mr. Palgrave in the *Agricultural Gazette* for March, and should be read carefully. The foot is a delicate structure, and grave injury is likely to be caused by careless shoeing. At the same time, injury can be very simply avoided by exercising a little care. The chief dangers lie in driving the nails in too far, and in cutting away too much of the lower surface of the hoof. The margin for driving the nails is so wide, however, that the careful workman need feel no alarm.

The various kinds of shoes are described in the article by Mr. T. G. Palgrave, M.R.C.V.S., in this issue, and by reference to it a proper selection can be made. Special kinds are required for some horses, but as a general rule the ordinary shoe is all that is required. The weight depends upon the size of the horse.

Before purchasing shoes, the size of the hoof should be carefully noted and shoes selected accordingly. If a well-fitting old shoe is available it can be used as a pattern, as the size of the prepared hoof rarely varies. When the shoes are bought at the local store, the horse can be taken in and the shoes tried. It must be remembered that the front feet differ in shape from the hind, and the right kind of shoes must be selected for each.

Fig. 3.—Fitting the Shoe.

When a good-fitting shoe is obtained, it saves further inconvenience if a stock for each horse is kept in readiness for renewals.

The making of shoes is a somewhat difficult operation, and requires more skill than is possessed by most amateurs, so that the home-making of shoes is not advised. If, however, the store shoes do not fit, they can easily be brought to the desired shape by heating and bending on the anvil. If the sides are too long, the ends can be cut off by using the sledge and hardie. When this is done, the precaution must be taken of standing well out of the way, as the end frequently flies off with considerable velocity.

Where a forge and anvil are available, the owner need not trouble very much about obtaining a proper fit when purchasing the shoes. Any shoe of sufficient weight in stock can be fitted by simply heating and hammering it to the correct shape.

The equipment for shoeing consists of a shoeing hammer, a rasp, a drawing or shoeing knife, a toeing knife, a punch, a pair of pincers, and a shoeing tool.

The old shoe is removed by knocking out the clinches, as shown in Fig. 1. The shoeing tool is held in the left hand against the clinched point and driven

Fig. 4.—Driving the Nails.

by the hammer held in the right hand. When the clinches are all straightened out, the shoe is drawn from the hoof with the pincers, as shown in Fig. 2. Any broken nails are knocked out, and the hoof is then ready for preparation.

When the bearing surface has been as nearly as possible obtained, the shoe should be heated and held by driving the punch into one of the holes. It is then pressed firmly against the bearing surface, using the handle of the drawing knife to increase the pressure, as shown in Fig. 3. The shoe is then taken away, and the degree of charring shows any inequalities. These are removed, and the hoof is then ready for the attachment of the shoe.

Some men object to hot fitting, claiming that the heat changes the structure of the hoof, but in practice it is found that the better fit which is obtained more than compensates for any disadvantages.

Fig. 4 shows the nailing of the shoe. The nail is inserted in the hole and guided by the fingers while it is driven home. Care must be taken not to drive the nail in too far, as it may come in contact with the sensitive foot and cause severe pain. If this happens, it must be withdrawn at once and

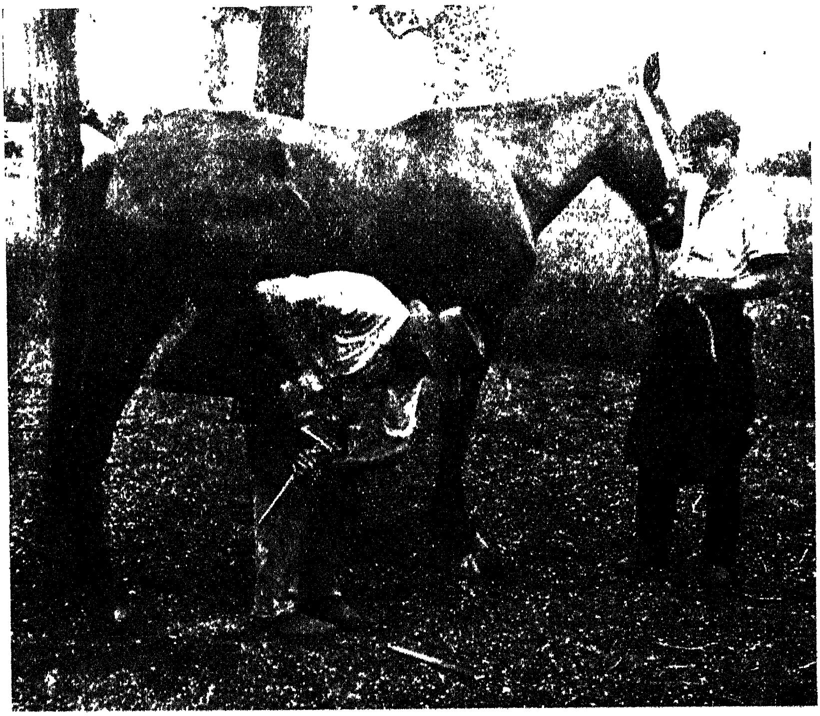


Fig. 5.—Clinching the Nails.

re-driven. A fairly long hold should be obtained. In some cases the nail is allowed to come out too low down, and the hold is not sufficient to retain the shoe for any length of time. When the nail has been driven up to the shoulder, the point is twisted off and a depression made immediately below with the rasp, so that when the clinch is made no rough projection is left. The nail is then driven as far as it can be forced and clinched, as shown in Fig. 5.

The hoof is finished off by using the rasp to cut down any rough projections, and to leave the edge of the hoof flush with the outside edge of the shoe.

Broom Millet

THE fact that along the lower Northern Rivers this crop has lately been found more profitable than maize has resulted in a great extension of its growth, so that it promises to become a large and permanent industry. But it seems that many farmers, some through ignorance of a new crop, but a few from dishonest motives, have been placing their produce upon the market in a manner which is not creditable to them, and which will, if unchecked, do considerable harm to the State. The matter has reached such a stage that the following manifesto has been signed by some of the principal broom-makers of Victoria:—

Dear Sir, Melbourne 20th December, 1910.

We, the undersigned manufacturers, desire to notify the buyers, growers, and broom millet business in general, that owing to the serious loss during the past three years, due to the excessive length of stalk, we will refuse to accept as proper value any millet in which the length of stalk exceeds six (6) inches.

Yours faithfully,

THOS. MITCHELL & CO., Ppty., Ltd.,
ALBERT OATES & CO.,
JAMES DAGLEISH,
DAVID DAGLEISH.

The Department is indebted to Mr. S. Wansey, Produce Merchant, Newcastle, for copy of the above manifesto, as also of the following similar one from the New Zealand manufacturers:—

Dear Sirs, Auckland, N. Z., 13th March, 1911.

We, the undersigned corn broom manufacturers of New Zealand, desire to notify the growers, handlers, and the broom millet business generally, that, owing to the serious loss during the past few years, owing to the excessive length of stalk and the careless method of scraping millet, we will refuse to accept as proper value any millet in which the length of stalk exceeds six (6) inches, or which is not thoroughly cleaned of seed.

Yours faithfully,

THE KAPAI CORN BROOM CO., Limited.,
BUNTING & CO., Limited,
OTAGO BRUSH CO., Limited,
STANDARD CORN BROOM FACTORY.

The serious nature of this matter may be gathered from the following extract from a letter, received by Mr. Wansey, from one of the New Zealand firms named:—

Regarding the concerted action being taken by the Victorian manufacturers on the question of excess stalk and false packing of millet, the idea is a good one, and we are taking steps to give effect to it. We have sufficient millet in hand to last till about the end of April, or perhaps the middle of May, and just now we are on the horns of a dilemma, wondering whether we should purchase in America or Australia. We have recently received a quotation for self-working Oklahoma; its equivalent in New South Wales would be £25 f.o.b., and we would prefer the American at £25 to the Australian at £23. The American comes full weight, short stalks, and can be always relied upon as stated, and exceedingly uniform. We have never had to complain of any shipments received from America. The millet received from New South Wales can never be relied upon; we have had a few shipments that turned out very well, but the majority of our buying has been unsatisfactory from your quarter. Things have now come to such a pass that we feel inclined to run on the American corn only, and to purchase from New South Wales as a stop-gap, whenever we should run short.

But that such neglectful or dishonest practices are not confined to New South Wales is evident from the following resolutions passed by the National Association of Broom Manufacturers, and the Broom-corn Shippers' Association at Chicago, U.S.A., relative to the buying of broom-corn in the season 1910–11 :—

Whereas many growers of broom-corn deliver their crops improperly handled and improperly baled, thereby damaging and defrauding members of this Association, therefore, be it resolved by the National Association of American Broom Manufacturers, Broom-corn Brokers and Dealers, in convention assembled, in Chicago, this 11th day of April, 1910, that we adopt the following rules for the proper handling of broom-corn by the broom-corn growers, and that this Association provides the following penalties for improper handling of broom-corn :—

Rule 1. All standard variety or cut broom-corn must be cut so that the stalks do not exceed six (6) inches in length.

Rule 2. All seed, boots, leaves, and trash, must be removed from the broom-corn.

Rule 3. Broom-corn must not be baled until it is thoroughly cured and dried, and there must be nothing but thoroughly cured dry broom-corn put in the bales. Crooked corn must not be baled with straight broom-corn ; it must be baled separately.

Rule 4. All broom-corn bales must be bound by five smooth soft wires, not heavier than No. 10 nor lighter than No. 11 American gauge. Dwarf broom-corn must have in addition cross wires on the four sides of the bales, securely fastened to the end wires.

Rule 5. Every broom-corn grower must place a tag on each one of his bales, bearing his name and address.

Penalty A. Baling up seed, trash, and foreign substances, and marketing same as broom-corn, is a violation of the criminal statute, and may be prosecuted to the fullest extent of the law.

Penalty B. In case a crop is not handled in accordance with the above rules, the damages will be collected. In addition to this, any penalties provided by law will be rigidly enforced. The baling up of seed, trash, leaves, and foreign substances with broom-corn and marketing same as broom-corn, being a criminal offence under the statutes of the State, the owners and those assisting in improper seeding and baling may be prosecuted to the full extent of the law. Any prosecution brought under the foregoing rules will have the full support of the National Association of Broom Manufacturers, and also of all broom-corn dealers and brokers.

It is hoped that this information will result in those growers who have been responsible for the state of affairs disclosed, mending their ways and placing their produce upon the market in a more creditable form ; otherwise the good name of Australian broom millet will continue to suffer.

Mr. George Marks, Inspector of Agriculture for the North Coast, states that most of the seed used on the Manning and other rivers is procured, without selection, from the bulk, as the brush is being prepared for market. In many instances the seed is in an immature condition. Mr. Marks considers that the deterioration of the quality on many farms is attributable to this cause.

Farmers growing, or contemplating the growth of broom millet, should apply to the Department for a copy of Farmers' Bulletin No. 20, "Broom Millet," by Mr. Marks. This pamphlet gives full information as to cultivation, harvesting, and baling. A copy may be obtained free upon application to the Under Secretary, Department of Agriculture, Sydney.

Winter Fodder Crops on the North Coast.

GEORGE MARKS, Inspector of Agriculture.

ONE cannot travel through the North Coast District during the winter and early spring months without noticing the bare state of the pastures, and, in many localities, the absence of any provision for green feed for dairy and other live stock. Paspalum and couch are valuable grasses, and produce an enormous amount of forage during their respective seasons; but the maintenance of a "single-grass" pasture does not allow of a regular and uniform growth of herbage throughout the year, even under the most favourable weather conditions. The heavy rains that usually commence to fall towards the end of December, or beginning of January, and continue at frequent intervals till after Easter, produce an abnormal amount of vegetation which cannot be kept down by over-stocking. The prevailing moist conditions, combined with the rank growth, cause a large quantity to mould and decompose, rendering it unpalatable and harmful to stock; and from these causes thousands of acres of grass go to waste each autumn. Such seasons are usually followed by more or less dry weather conditions during the winter and early spring months. When paddocks are shut up to allow the grass to grow and provide a supply for the winter, the nutritive value is frequently considerably reduced by the leaching action of the rains; and though frosts may not be severe enough to kill the herbage, the cool winter, accompanied by dry westerly winds, has the effect of stagnating growth, with the result that before the warm weather sets in and spring showers fall, the paddocks are eaten bare and stock suffer in consequence.

To the dairyman, few matters are of greater importance than the adequate provision of a plentiful supply of suitable green feed. Unless this is assured, the milk supply must necessarily diminish, even though the condition of the animal may not suffer a great deal. The experiences of the past few seasons have proved conclusively that the farmer who relies solely on his pastures for feed must surely suffer, and should he be compelled to sell in order to prevent starvation, the prices he receives for his stock do not compensate him for all the trouble he has gone to in rearing them.

Though different districts vary somewhat in their seasons, it may be stated generally that the winter and early spring months are the periods when the natural herbage is scarce, viz., June, July, August, and September—the last-named being usually the worst month. Where winter fodders are grown they are usually grazed off by turning stock in the cultivation paddock for a short period each day. This causes losses in several ways—first, through a large amount being soiled, pulled out by the roots, or trampled in by stock; secondly, there is loss in tonnage per acre, through the crops being fed off

while young; and, thirdly, there is considerable loss in feeding value, due to the excessive amount of sap when fed at this early stage. While in many instances the practice may be considered justifiable through scarcity and expense of labour, or the multitude of farm duties that have to be performed, the fact remains that the farmer does not secure the full benefit of the land or crop. During wet weather stock have either to be kept off, or, if they must be grazed, the physical condition of the land under cultivation is greatly impaired. This is especially the case on the black alluvial soils of the river banks. When, however, the crops can be left till they attain their maximum green growth, and are then fed, the greatest return as regards both quantity and feeding value is assured.

Another fact generally lost sight of is the manner in which seeds of couch, paspalum, summer-grass, water-couch, and other grasses are introduced to cultivation areas through the droppings from the animals. Large quantities of seed pass through the system without having their vitality affected, speedily germinate, and take possession of the land.

A continuous supply of green feed can generally be obtained by sowing smaller areas at intervals of a few weeks, in preference to a large area planted at one time. The area to be planted depends upon the severity of the winter months and the number of stock to be fed.

On the deep, rich alluvial lands that are well drained, lucerne is not grown as much as it should be. The principal reason appears to be that the land is not properly worked and got free of weeds before sowing, with the result that they speedily take possession, and smother the lucerne. The growing of this king of fodder plants would also provide a food rich in protein, so necessary for the milking cow.

Oats and rye are the principal crops grown for winter feed. On account of the moist, warm conditions so prevalent on the coast, rust invariably destroys all varieties of oats excepting the Algerian, and even this rust-resistant variety often becomes so badly affected that stock will not touch it

Rye is grown by many in preference on account of its hardiness. It provides a good feed while green; but if allowed to approach maturity it becomes somewhat harsh and wiry in nature, and develops a large proportion of indigestible fibre material, which also renders it unpalatable. Those who grow it must keep a watchful eye over the crop. At the flowering period it is subject to a disease known as "ergot," which many would take for an ordinary smut. If fed to milking cows at this stage it will cause abortion.

The North Coast must not be regarded as a district adapted to haymaking, but there are frequently spells of dry weather during September, October, and November when such operations could be successfully carried out. In some parts—notably on the low, moist lands of the Lower Manning—excellent hay is made by planting Algerian oats in July, August, and September. The late planting practically ensures freedom from rust, and provided the spring is not too dry, very fair returns are obtained.

The inclusion of a leguminous plant, such as tares or field peas, with wheat, oats, or rye will largely increase the feeding value, and at the same

time provide a heavier yield without impoverishing the soil. On light, sandy soils tares grow well; while field peas give better returns on heavy, rich soils, or soils of a clayey nature.

It is pleasing to note that on the Belmore River—a tributary of the Macleay—large areas of field peas are grown each winter for feeding milch cows. Besides providing a rich milk-producing food, the refuse is ploughed under in the spring, and the soil is considerably enriched for the summer crop of maize. By this practice, several farms which were formerly considered too poor for growing maize are now giving profitable returns.

Trials of Portuguese Onion Seed.

In May, 1909, Mr. H. E. Pratten, of Ashfield, forwarded to the Minister of Agriculture a sample packet of onion seed which he had specially selected when in Portugal. The seed was distributed to the Hawkesbury Agricultural College and Bathurst and Glen Innes Experiment Farms, and was sown in the autumn of 1910. At Glen Innes the crop failed, but at the College and Bathurst very satisfactory results were obtained. The following is a summary of the reports:—

Hawkesbury Agricultural College.

Seed sown, 18th March, 1910; transplanted, 19th May, 1910.

Three varities were tried, and these were transplanted into permanent beds with two local varieties, Brown Globe and Long-keeping Brown Spanish.

1. *Imperial White Crystal Wax* produced less than the average top growth, and was earlier in maturing than the local varieties. The onion is of a flat shape, with a pleasant milky flavour, devoid of sharpness, whilst being firm and crisp. It has a thin skin, and does not keep well. It exceeds the average of the local and the other two varieties in size and yield per acre. Matures a little earlier than the local varieties. White in colour.

2. *White Straw Bermuda.*—Identical in growth and quality of onion with above, but a little earlier and somewhat smaller. Yield per acre should be well up to the average.

3. *Red Straw Bermuda.*—Resembles Imperial White Crystal Wax in top growth, in earliness, and yield. More rounded in shape, resembling the local varieties more. Has a sharper flavour, with absence of milkiness in taste. Skin, red and thick. This onion is a good keeper.

All of the varieties were earlier and produced considerably less top than the local varieties. As all-round onions they compare very favourably with the best of our local varieties.

Unfortunately, owing to scarcity of labour, the crop was not harvested; consequently, actual yields per acre cannot be given. The seed was lost on account of severe hot weather causing the seed tops to scald badly.

Bathurst Experiment Farm.

The trial was made upon the irrigation area, and comparison made with Brown Spanish and Yates' Selected Long-keeping, which had given best results during previous years. Estimated yields:—

	t.	c.	q.		t.	c.	q.
Brown Spanish	4	6	2	Yates' Selected Long-keeping	4	7	1
Portugal onion	7	6	0	Portugal onion	7	7	3

The Portugal onion thus proved more prolific. Its keeping qualities have not yet been tested.

Cheese Shipped to London from Hawkesbury Agricultural College.

THE CONSUMERS' OPINIONS.

READERS will remember the official reports upon the twelve crates of cheese recently sent from the Hawkesbury Agricultural College to the Agent-General in London, which were published in the press, and in the *Gazette* for March, page 235. But what the gentlemen reporting upon the cheese did *not* know was that in the centre of each cheese was a small glass tube containing a little roll of paper with the following inscription :—

Hawkesbury Agricultural College,
Richmond, N.S.W., Australia, 28/8/10.

MEMO. from the Principal to the Vendor or Consumer of this cheese.

I will esteem it a favour if you will candidly give me your opinion of the flavour and condition of this cheese.

With our thanks ahead for your courtesy.

I am, yours faithfully,
H. W. POTTS,
Principal.

The following are the replies so far received by Mr. Potts. They speak for themselves; and, being from the people who purchased the cheese or make their living by selling them, they furnish a good indication of how our cheese, if properly marketed, will be received in Great Britain :—

No. 1.

Peppercorn Bros., Ltd., Decorators and Furnishers,
Deptford Broadway, London, S.E., 4/2/1911.

Dear Sir,

In reply to your note enclosed in bottle in coloured cheese, I have very carefully tasted this in comparison with New Zealand and Canadian, and I have no hesitation in saying that it is better than the average New Zealand and quite equal to the best Canadian.

Wishing you all success—we have a practically unlimited market here for good stuff—and trusting that your new world may prosper and help to redress the balance of the old.

am, yours very truly,
FRED. PEPPERCORN,
Buyer and Managing Director.

No. 2.

S. J. Hart & Son, 247-249, High-street, Chatham, 7/2/1911.

Sir,

Enclosed memo. was found in a cheese bought by us last week.

The condition of the cheese is excellent, and fully equal to any New Zealand cheese. The flavour is good, and suits most of our trade here, but it lacks the character which one finds in the best Canadian cheese.

Perhaps you can send us some photographs of butter and cheese making in Australia suitable for framing.

Thanking you in anticipation.

Faithfully yours,
S. J. HART & SON.

No. 3.

Dear Sir, The Nyewood Stores, West Bognor, January 21, 1911.

In answer to your message contained in a bottle in a cheese cut by one of my assistants, I found the flavour of the cheese very good, condition all right, but not quite up to some Canadians I am cutting as well. There was not the full flavour as in the Canadians—I do not mean strong, "bity" to the tongue. On the other hand, I do not get any complaints from my customers. By the way, my assistant cut the bottle almost in two and splintered it in the cheese, but that difficulty was got over all right.

I enclose two photos of my shop—outside and inside.

I am, yours faithfully,
THOS. TREGEAR.

Importation of Potash Manures.

In 1890 the first ton of sulphate of potash and 2 tons of kainit were imported into this State privately.

The agricultural offices of the Potash Syndicate have furnished the following return of the potassic fertilisers imported by them into New South Wales during the ten years ending 1909. Readers will note the terrible influence of the year of drought, 1902:—

Year.	Sulphate of Potash.	Muriate of Potash.	Thirty per cent. Potash Manure.	Kainit.	Total.
	tons.	tons.	tons.	tons.	tons.
1900 ...	146	9	....	49½	204½
1901 ...	93	4	....	25	122
1902 ...	14	....	....	25	39
1903 ..	85	9	....	75	169
1904 ...	170	15	....		185
1905 ...	260	15	....	....	300
1906 ..	400	5	5	25	450
1907 ..	286	....	25	40	346
1808 ...	315	5	50	35	390
1909 ...	670	....	50	20	740

Mange in Horses.

Mange can certainly be eradicated by proper treatment. The hair over and for some distance around the affected parts should be clipped and burnt. The parts should then be thoroughly washed with soft soap and warm water, and after drying, the following dressing should be applied with a brush:—

Sulphur sublimed	1 part.
Linseed oil..	8 parts.

This should remain on for a week, and then be washed off and the same dressing repeated.

Affected horses should be isolated, and any harness or clothing used on them should be boiled if possible. Where this cannot be carried out they should be soaked in a 10 per cent. mixture of Jeyes' Fluid and water.—C. J. Sanderson, M.R.C.V.S.

Bag-shelter Caterpillars of the Family *Liparidæ* that are reputed to kill Stock.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

A GOOD deal of interesting matter has been published about these curious caterpillars. In 1906 the writer contributed a paper to the Proceedings of the Linnean Society of New South Wales, "On the Bag-shelters of Lepidopterous Larvæ of the Genus *Teara*," when the makers of these curious structures were identified for the first time. Some years later these moths were described in an illustrated article on these pests in this journal, "Entomological Work and Notes for 1900," *Agricultural Gazette of New South Wales*, Vol. XII, 1901, page 794. The plate is reproduced in "Australian Insects, 1907."

From an economic standpoint these moths are a very interesting group of our Australian Lepidoptera, as they belong to the same family (*Liparidæ*) as the notorious Gypsy Month (*Porthetria dispar*), which was introduced many years ago into the oak forests of Massachusetts, and has since spread and increased to such an enormous extent that it is one of the most serious pests in that part of the United States. Hundreds of thousands of dollars have been spent to keep it in check, but, up to date, it is one of the most serious insect pests in the world. All the leading entomologists in America have been working at its suppression, but still the Gypsy Moth holds the place of honor as one of the worst pests in the United States.

Other groups, commonly known as the "Brown Tail Moths," also do a great deal of damage in America and Europe in defoliating the forest and orchard.

Under similar conditions, the "Bag-shelter Moths" of the genus *Teara* might become a very serious enemy, as, with similar habits, they are often very abundant, and strip every leaf off the trees infested.

The common species in New South Wales is *Teara contraria*. Though it feeds upon many different trees along the coast, in the west it confines its attention to the foliage of the graceful weeping myall (*Acacia pendula*), which is one of the most characteristic and handsome of scrub trees, growing in clumps in the open spaces of the scrubby forest, or along the edge of the plains. Wherever any land is enclosed and protected from stock, these acacia seedlings spring up in numbers, and the horse or home paddocks are usually ornamented with clumps of these trees on most of the western homesteads. Like the kurrajong, the weeping myall is one of our most valuable fodder

trees, and in times of drought the edible foliage of the lopped branches has furnished food for thousands of starving sheep and cattle. Land where the weeping myall flourishes is always looked upon with favour by the western squatter.

The partiality that these caterpillars show for the leaves of this tree has, however, made a considerable difference in its value as a standby in time of drought. Just at the time when the leaves are wanted, when the grass is gone, where the caterpillars are abundant there is not a leaf on the trees.

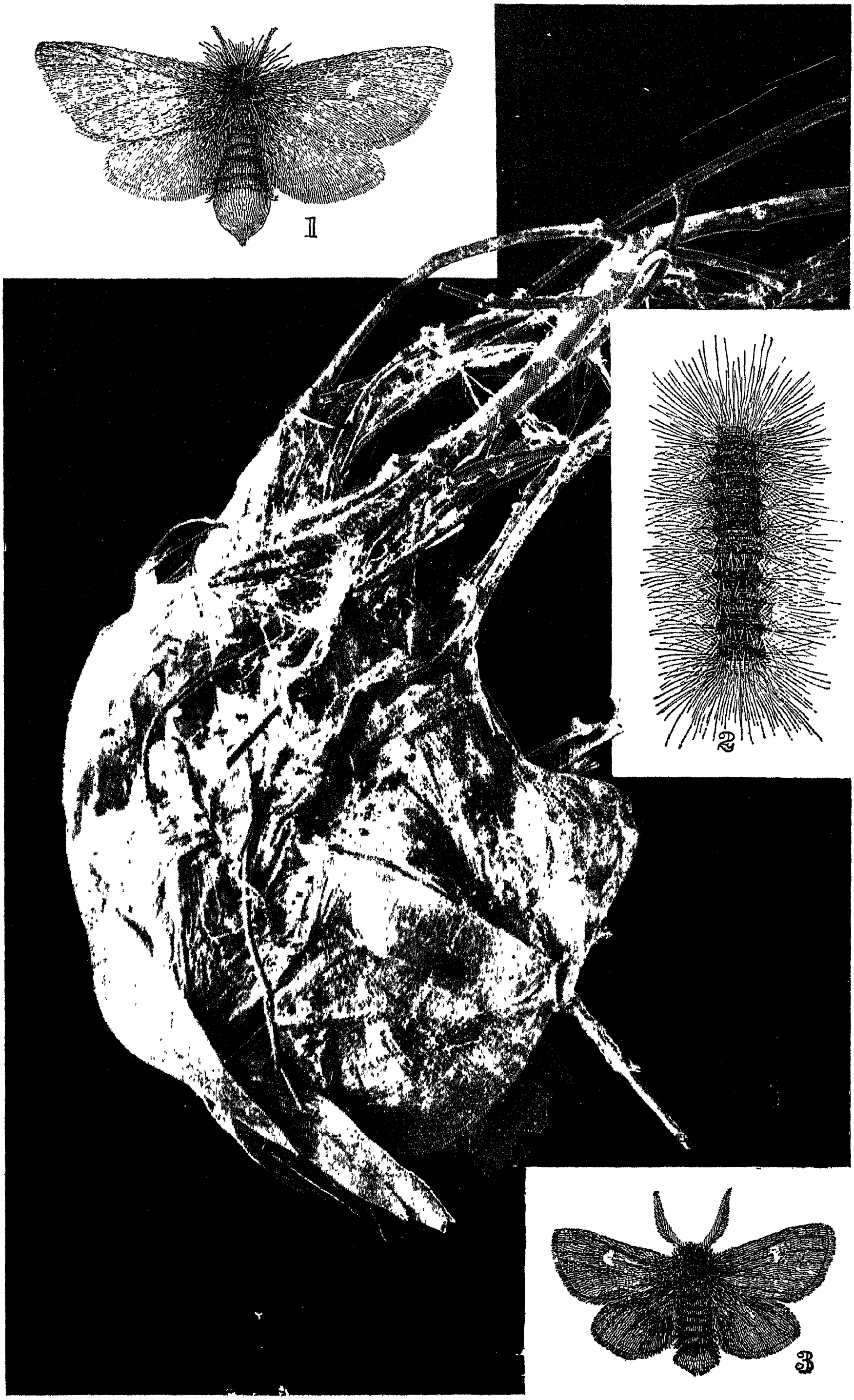
Many squatters, recognising this, undertake the destruction of these caterpillars by cutting out their bag-shelters and destroying them before the trees are defoliated. This can be very easily done, even on a comparatively large acacia, if the operator be furnished with a cutter at the end of a light pole, such as is used by the foresters and gardeners in Europe. Care, however, should be exercised in handling these bag-shelters, for they are full of fine stiff spines and hairs cast from the bodies of the caterpillars. If these fall upon the hands and arms they may enter the skin, and sometimes cause a very painful and serious rash. Mr. White, of Belltrees, informed me some time ago that two of his men engaged at this work were so badly attacked by the rash that they had to go into the hospital for treatment.

Another settler near Nevertire, in the course of conversation, when I was collecting among the weeping myalls, warned me of the unpleasant consequences of handling these bag-shelters, and said that once when cutting them off some trees while on horseback, he let one drop upon the horse's back behind the saddle, where the contents were scattered, and shortly afterwards the horse seemed to go almost mad from these tiny hairs getting into the skin.

I might note that the employees of the Gypsy Moth Commission at Boston, when going through the somewhat similar nests of that moth, were well aware of the stinging properties of the hairs, and always wore long gauntlet gloves to protect their hands and arms.

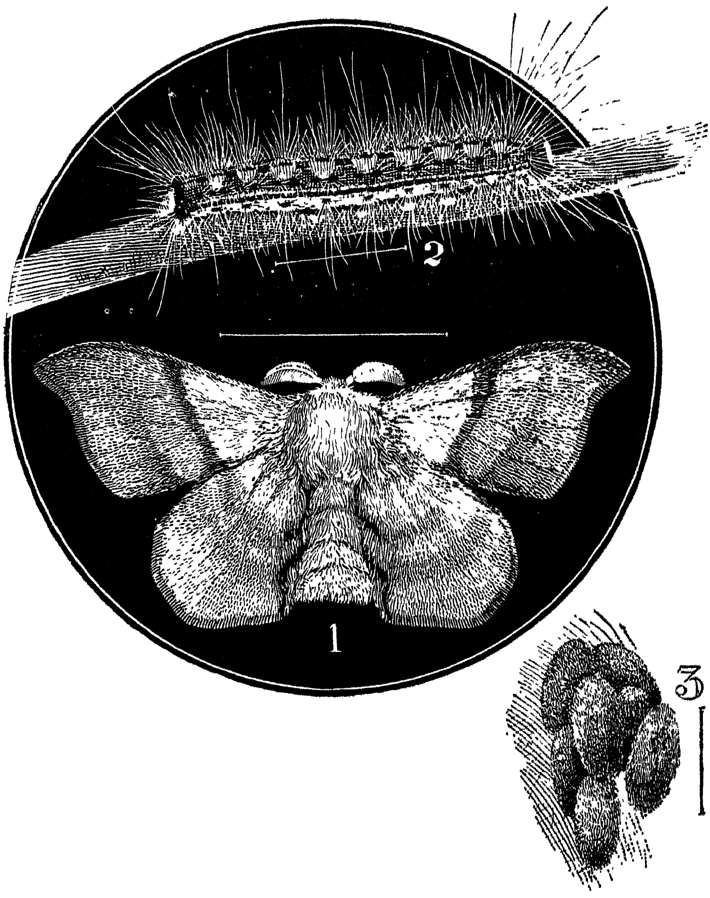
A second species of Bag-shelter Moth (*Ocinara Lewinæ*) was also recorded as doing a great deal of damage to the eucalyptus forests along the South Coast, about Bega and Bateman's Bay (*Agricultural Gazette of New South Wales*, Vol. XIV, October, 1903, page 1022). This is a much smaller reddish-brown moth, measuring up to about half an inch across the outspread wings. The larva is a long, slender caterpillar, clothed with scattered long hairs, and a very characteristic pad of short hairs on each side of all the segments. These caterpillars, unlike the former species, do not always go into the ground when full grown, but pupate among the leaves of their bag-shelter, sometimes with hardly any distinct cocoon. When kept in the breeding-cages they pupate outside the bag-shelter, forming regular, felted cocoons from the hairs of the body.

In the middle of January this year (1911), the writer received the following interesting report, accompanied with some of the larvæ, pupæ, and



Bag-shelter Caterpillars (*Teara contraria*, Walk.).

1. Female Moth. 2. Larva. 3. Male Moth. 4. Bag-shelter or nest in which the Caterpillars live.



Small bag-shelter Moth (*Ocinara lewinæ*).

1. Moth [Enlarged].
2. Caterpillar.
3. Cocoons.

bag-shelters, from which the moths have since been bred and identified as *Ocinara Lewinæ* :—

From W. C. Fraser, Hon. Sec., The Gilgai Progress Association.

Sir,

Under separate cover I have this day posted to you specimens of what is locally known as the "hairy grub" or "itchy caterpillar." At present there is a plague of them in this neighbourhood; trees for miles around are covered with their webs in hundreds, and the grubs in millions. They have eaten nearly all the leaves off the trees, giving the appearance of wholesale ringbarking. They at first attacked the wild apple tree (*Angophera subvelutina*), but they soon destroyed all their foliage, and then went for all other sorts of bush trees. When the grubs grew to about 1½ inches in length they left the nests, and came down the trunks of the trees in millions, getting on the grass; the stock picked them up when grazing.

This caused swelling of the lips, tongue, or any other part that the grubs came in contact with. In a great many cases death ensued.

Getting on a human being, they caused a great itching and tenderness. I heard of one man who had lost an eye, and almost lost the other, through these caterpillars.

I am directed by the above Association to forward the specimens to you, and ask you for all information concerning them. What is the proper thing to do where stock are affected; ditto human beings?

Shortly afterwards, a second report reached me through the Chief Inspector of Stock, who has kindly furnished a copy to include in my notes. The moths bred from specimens forwarded were also *Ocinara Lewinæ* :—

Pastures Protection Board Office,
Armidale, 20th January, 1911.

Chief Inspector of Stock, Sydney.

Sickness with Mortality amongst Horses near Bundarra.

Sir,

In connection with the above subject, I have the honor to furnish my report herewith.

On receipt of your authority, I proceeded on the 14th instant to Bundarra, and on the 16th instant reached the locality in which the trouble was prevalent but had somewhat abated.

On the 15th instant I went to Clerkness holding and interviewed Mr. A. Wiseman, also Constable Clarke of Bundarra, and others, in order to obtain information regarding the holdings on which the malady was most severe. I then proceeded to "Sentry Box," the property of Mr. H. Mackenzie, and inspected several horses and about one hundred head of store bullocks. No departure from normal state of health was observed, the stock being in good condition and running on abundant feed.

On the 16th instant, in company with Mr. Mackenzie, I visited the holdings of Messrs. Readett, Townsend, Gaffey, and Brown, such holdings being situated between 3 and 4 miles over my north-western boundary, and in the Tamworth Pastures Protection District.

I inspected five horses at Townsend's, three horses at Readett's, also two horses on Brown's holding.

In each case of examination on the two latter holdings, the horses, ageing from three to eight years, of saddle and light draught classes, presented a starved appearence. Temperature, pulse, and respiration were normal. On opening the lips and mouth, two ulcerated patches were observed on the gum of the lower jaw under the lateral incisors, about the size of a shilling piece. The ulcer scars were healing. On examining the tongue, in two instances the mucous membrane of the dorsum, extending about 3 inches from the apex, was gone; ulceration had been present, but wound was healing. On further examination the back of the tongue of one animal showed the seat of what had lately been a large ulcer; no further ulceration was noticeable, and the colour of the gums was healthy.

The animals inspected had, according to the owners' statements, until about five days previous to my inspection, been very depressed in general health appearances. The

tongues were considerably swollen and hard, with large sores on tongues and gums. The animals were unable to chew or crop the grass, which this season is in abundance. They were practically starving, and constantly lying down. The duration of these symptoms was about ten days. Deaths had occurred on Gaffey's holding (1), and also on Brown's (2) about a week previous to the 16th instant; consequently I was unable to procure specimens from these carcases; but the owners informed me that precisely the same symptoms existed in these cases prior to death, as had been noticed in those I inspected, and have before mentioned.

I also received information from Mr. Wiseman, of Clerkness, that several horses had died and others had to be destroyed on The Grove holding, the property of Mr. Whitfield, in the Inverell District, recently, and that such horses were affected in a similar manner. I also inspected sheep and milking cows on holdings where the malady was, but on examining the mouths of several sheep and three cows, nothing abnormal was found. As to the cause of this ulceration in the mouths of horses, I am of the opinion that it is due to a caterpillar.

From the month of October until quite recently, a caterpillar has been present in countless numbers. This season they have been far more numerous, in certain localities, than in recent previous years. It is reported that they existed in great numbers in this district some years ago, and then gradually disappeared.

They attack the foliage of the stringybark and wild apple (*Angophera subvelutina*) principally, but are also found on the peppermint, box, and wild cherry trees. In localities where these classes of green timber exist, thousands of acres at the present time carry the appearance of timber country which is dying as the result of "ringing." It would seem that the caterpillar emits a secretion which causes intense and prolonged irritation to the human skin, should one of these happen to come in contact with it.

I saw a child at Bundarra whose hand had to be lanced three times as the result of inflammation arising from these caterpillars crawling on to it.

I have experienced intense discomfiture when camping out recently through the caterpillars making their way into my tent, and people in some localities were almost compelled to leave their houses through the incursions of these grubs.

After denuding a tree of its foliage, they move to another, and in so doing crawl over the grass, which it is feasible to suppose is the medium of infection to horses.

One person informed me that in drenching with salts and carbonate of soda a horse which was affected, the animal coughed up a quantity of caterpillars and phlegm. Whether this statement is reliable or not, I am, unfortunately, not in a position to affirm.

At the present time, the caterpillar is entering into the chrysalis stage, the cocoon being spun principally between the furrows of the bark of trees upon which it has fed. The coincidence by which the trouble has abated at the time of the recent heavy rainfall of 3 inches, and since which downpour very few caterpillars may be seen, leads me to the conclusion that the caterpillars were the cause of the subject malady.

Comparing the tongue of the horse with that of the bovine tribe, it would seem that the latter's rough and thicker membrane would protect it from ulceration of this source. Again, to compare the sheep with the horse in grazing over the same country, that the former has not been affected might be explained by the fact of the smaller mouth, and also that the sheep is more observant of the place from which it is feeding.

No doubt in time these caterpillars will make their appearance in large numbers where at present they are hardly noticeable, only an odd tree having the recognisable silken pouch, which the caterpillars spin when they first attack a tree, but from which they take a departure before entering into the chrysalis stage.

I believe no bird life eats this caterpillar, but I have found that they (the caterpillars) have their parisites in the form of a brown hairy weevil, which is very active, and destroys both the chrysalis and the caterpillar. There is also a beetle or bug which I have discovered in large numbers under the loose bark of trees where the caterpillars are, and from experiments I have noticed that this beetle or bug will destroy the caterpillar.

As to treatment for the subject malady, which may be expected annually from November, when the caterpillars are moving over the ground, it is possible to isolate stock in paddocks devoid of green timber, such as stringybark and apple.

This caterpillar as a pest has caused many holders to decide upon "ringing" useful fodder trees, as we are aware that in droughty seasons the wild apple is a good stand-by as a fodder.

Owing to the lateness of the season, I am experiencing a difficulty in securing specimens of the caterpillars, which I will forward to you as soon as I can procure same, including the parasitical weevils and beetles.

I have, &c.,
C. L. G FIELDER,
Inspector of Stock.

From the evidence brought forward in these reports, it appears that Stock Inspector Fielder's supposition that this form of "horse sickness" is the result of the horses feeding over pasturage swarming with these slender hairy caterpillars is correct. These hairs coming in contact with the delicate membrane of the mouth, cause the ulceration observed by Mr. Fielder, and sometimes even the death of the animal.

Such pests as these "Bag-shelter Moths," or "Processional Caterpillars," are difficult to deal with when once they leave the trees; but in the earlier stages of their development, when living in their silken bags, they could, with a comparatively small outlay, be collected and destroyed. They could be kept upon the tree-trunks by placing a tarred bandage round it, and then as the full-grown larvæ congregate above trying to reach the ground, they could be swept off and burned, or thrown into boiling water.

It seems a great mistake for the settlers to want to ringbark what they acknowledge to be good fodder trees, simply because they are infested with caterpillars, when, with a little trouble, the trees could be used as traps upon which the bag-shelter caterpillars could be confined and destroyed.

Herd-testing Associations.*

M. A. O'CALLAGHAN.

FOR some years now, most countries in which the dairying industry has been developed to a high extent have been making special efforts towards improving the milk yield of their cattle, and it has been found that one of the great factors influencing the farmer against progress is a want of knowledge as to the productive capacity of the several cows in his herd. Those farmers who send their milk or cream to a butter factory know what the entire herd does in the way of butter production, that is, provided the butter factory supplies them with accurate figures representing their monthly yield. Unfortunately, however, no accurate information is possessed by the farmer, as a general rule, concerning the individual butter yield of any of his herd. He may have a rough idea of the milk yield as judged by observations made when the animals are being milked, but even then, he can only form a very rough estimate indeed as to the amount of milk which any one cow in his herd gives in a year. Some of them milk heavily for a while, and then quickly dry off; others again never yield a great quantity at any one time, but are persistent milkers, and when the year is ended it will be found that such cows, as a rule, give very much better returns than those "flash" animals which milk heavily for a time and then proceed to lay on beef.

It was found that any attempt on the part of educational authorities to get the farmer to keep individual records resulted in non-success. Then the idea of having co-operative associations was introduced. I believe the Danish farmers are responsible for the initiation of the movement. In that country co-operative effort is so common that there was nothing unusual in the suggestion, and associations were rapidly formed throughout the country for the purpose of arranging that a regular test should be made of the herd of each member at stated intervals.

Method of Procedure.

From letters which I have received from farmers who are interested in herd-testing associations, one would imagine that there was something difficult to undertake; but though different methods have been adopted in different countries for having the testing done, still the main idea is the same. Two

* From an advance proof of "Dairying in Australia," published by Messrs. Angus and Robertson, Sydney.

or three associations have been formed in New South Wales, and the methods adopted have been as follow:—

(1) A meeting is called of those interested, generally by the secretary of the local Agricultural Society, and some person who is acquainted with the work of organisation, generally an officer of the Dairy Branch of the Department of Agriculture, attends and explains all that is necessary in the way of details. Those who desire to have their herds tested then hand their names in as members, and an estimate is formed as to whether one or two people will be required to do the testing.

(2) A few simple rules are now drawn up arranging for the management of the association, and fixing the scale of charges for membership.

(3) Having obtained a sufficient number of members, one tester at least is appointed, and an outfit is procured.

(4) The duties of the tester are now arranged, and these are usually as follow:—(*a*) He shall visit each herd at least once a month, and take samples from the morning and evening's milk of each cow, the milk having been previously weighed and recorded. (*b*) The milking finished and the samples taken, he proceeds to do the testing, a composite test representing the mixed morning and evening's milk of each cow being sufficient for the purpose in view. (*c*) He now enters up the record sheet, and leaves a copy with the farmer before proceeding to test the next herd. In some cases a secretary is provided, who obtains the rough records from the tester, calculates out the commercial butter results for each cow, and sends the complete returns to each farmer concerned. This was the method which was adopted by the Illawarra Herd-testing Association, which was the first of its kind formed in New South Wales.

Criticism of Methods.

The Illawarra Association, which had its headquarters in Berry, was originally stimulated by a money grant from Mr. Alexander Hay, who took a keen interest in everything concerning dairying; but this association was a short-lived one, as, owing principally to a severe drought which set in a few months after its formation, the cattle gave so little milk that the farmers did not think it worth while going to the bother and expense of having it weighed and tested. The cost of carrying on the work also militated against its re-introduction when the drought period had passed, and it is regrettable to have to state that, despite a Government subsidy to the extent of 10s. in the £ having been promised by the present Minister of Agriculture, no steps have yet been taken to renew the work which at first promised to be so interesting and educational.

The second association was formed under most auspicious circumstances at Alstonville, Richmond River, the Department of Agriculture having given £ for £ subsidy to assist the amount of revenue obtainable from members' subscriptions; but, sad to relate, this association has also handed in its

resignation, and though the first year's work proved extremely interesting, the Alstonville farmers are now in the same position that they were a year ago, with this exception, that they know something of the animals which compose their herds at the present time. The Alstonville body went to a considerable amount of expense and equipped their tester with a horse and trap with which to carry his Babcock machine from farm to farm.

The Question of Cost.

Seeing that the first and second associations which were formed have abandoned the work, a good deal on the score of expense, it is time to reconsider the methods of working to see if a system cannot be devised which will give better results. When the Illawarra Association was being formed I strongly advised the members, instead of employing two men to do the testing at the farms, to have all the milk sent to a central place, such as the local butter factory, and have the testing done there by a specially-paid operator. I am confident that this system of centralising the testing and record-keeping would have been far cheaper, but the farmers of the association referred to were so desirous of having the work performed on their own premises, that they preferred the home method, even though more expensive. Probably this desire was stimulated by a wish for secrecy to be observed in connection with the yields of their cattle, but the same secrecy, or even greater, could be observed by an operator working constantly at a central place, and sending out the records by post.

If it is any encouragement to other associations, it may be stated that for some reason or other a somewhat similar calamity befell the earliest movement in connection with cow-testing associations in Canada. A number of farmers who took up the work discontinued after a few months, but the satisfactory part comes in when we learn that these farmers have, as a general rule, renewed their efforts, and now the movement, after five years' trial, is on a very successful basis.

Canadian System.

The Canadian Government has taken a very active part in the formation and also in the maintenance of herd-testing associations. At first a great deal of educational work was necessary before the farmers could be got to take an interest in the movement. By the use of special organisers, however, and by solid financial support, the Canadian Agricultural Department succeeded in placing the movement on a sound basis.

Whenever a body of farmers become sufficiently interested to desire an association, the Department of Agriculture sends a speaker to attend the meeting called for the purpose of organisation, and the whole details as well as the nature of the support forthcoming from the Department are thoroughly explained. The following is their method of working:—

Each member of the association provides his own outfit, which consists of a scale on which to weigh the milk, and set of bottles in which to hold the samples, one bottle being necessary for each cow in the herd. The Department of Agriculture pays for having the testing done, the allowance being

at the rate of 5 cents (2½d.) per test. This would mean about £6 a year to a herd consisting of from 40 to 50 cows, but the cost of testing appears higher than would be necessary in this country. In addition to the fee mentioned, the Canadian Government also supplies the acid for testing the samples, and the blank forms for record purposes. The tester sends in his results to the office of the Dairy Branch, and records are there kept of all the work done. The calculations are worked out in commercial butter results, and a record sheet is sent to each member showing the totals of milk and butter for each cow. In addition, three experts are employed for supervising the work. They visit the different centres to see that the work is thoroughly done, and to consult with and advise the members of the association.

From the foregoing, it will be seen what a practical interest the Canadian Department of Agriculture takes in the work of these associations. Herd-testing associations are to the Canadian Department of Agriculture what our agricultural shows are in dairying districts here, and one is now and again forced into asking oneself the question: Which institution would be the more educational for our dairy districts—a Herd-testing Association, which would be in a position to give the milk and butter records of each cow in the district; or an Agricultural Society whose main, and in some instances only, educational work consists in the organising and holding of an agricultural show, at which different judges frequently express different opinions on the merits of the same animals. I do not wish in any way to belittle the good work which is done by many agricultural societies, but if the best judges possible were secured, it should be sufficient for each animal to compete against the other once a year, whereas at the present time, owing to the great number of shows held in what is practically the one district, the same animals meet several times a year, but under different judges. The result is that the decisions are frequently reversed, and an unadmiring audience then criticise the educational value of such exhibitions.

Importance of Herd-testing Associations.

Let us allow our imagination to have its fling for a few moments and picture the position in which Australian farmers would be to-day, if they knew exactly the productive capacity of every cow used for dairying purposes throughout what might be termed the dairying districts proper. I am afraid if the knowledge came too suddenly, the shock would be so great that the accommodation at the local sale-yards in every district would be altogether inadequate to hold the number of "very promising" dairy cows that would be submitted for sale. These cows would be *all promise*, and very little result, and woe be to the innocent young man who would be attracted by their promising appearance. I am sure that if herd-testing associations were common throughout Australia, and that there was a common rule compelling all animals that gave below a certain minimum production per year to be branded with some indelible mark of inferiority, a number of animals now kept for dairying purposes would soon find their way to the abattoirs, and

among them would be, I am afraid, a good few cattle that are exhibited in our show rings, and whose only recommendation to merit is perhaps a handsome head and horns. These latter, of course, are shown either as heifers or cows not in milk.

Yields of our Dairy Cattle.

Although we cannot expect that the yields of dairy cattle in New South Wales shall be equal to those in countries were droughts are practically unknown, we can at least expect good records from those districts where droughts are rare, such as the Richmond River district. But a review of our dairy statistics shows that the cattle of even our most-favoured districts have yet to make a very great improvement before they can be considered up to the standard of good average dairy cows. After taking some trouble to check the figures furnished to the Government Statistician, by comparing the estimated yield with the actual factory returns, I have come to the conclusion that the figures published by the Government Statistician are sufficiently reliable as regards our principal dairying districts for our purposes. The following are the averages for the year 1907 :—

District.	Milk yield in gallons.
Counties of Rous and Richmond ...	363
Clarence district ...	292
Hunter River Valley ...	263
Ulladulla and Moruya districts ...	319
Auckland (Bega district) ...	284
Macquarie district (which includes the Manning and Hastings districts) ...	290

Owing to the great development of dairying during recent years, the demand for young dairy cattle was greater than the supply, and, as a result of this, all female animals were bred from, and all heifers reared in dairying districts were brought to the dairy. Hence there was absolutely no selection, and, therefore, we have a great percentage of very inferior dairy animals. Of late, however, a change for the better has set in. The supply has more than reached the demand, and, as a consequence, prices for young dairy heifers are so low that farmers will, for some time at least, only rear heifer calves from their very best cows, and thus we should see a distinct improvement in our milk yields in the next few years.

The present then is a suitable time for the establishment of associations which would aid the dairy-farmers to cull out the drones from their herds, and to give them information which would place them in a position to know exactly which cows were worth rearing heifer calves from.

A Suggestion.

Every butter factory has all the accommodation for the rapid testing of milk and cream, and the testing appliances are now only used during three or four hours of the day, except in some extremely big factories. Here then an opportunity is presented for making full use of the testing-room and appliances in each butter factory. Let the directors of each co-operative

butter factory organise a herd-testing association in connection with their suppliers, and where necessary let a special person be paid to do the testing of the milk and the keeping of the records. As an encouragement to do this excellent work there is the offer of the Minister of Agriculture to subsidise, to the extent of 10s. in the £, the funds that are subscribed by the farmers for the purpose of carrying on the work of the herd-testing association, a stipulation being that the record books should always be open to authorised officers of the Department of Agriculture for inspection purposes. If possible, the Canadian system of having all records filed in the office of the Department of Agriculture should also be adopted, and this would enable a considerable amount of educational matter to be disseminated annually among the farmers of the State, without any information as to whose herds were represented being made available to the public.

Advantages of this Method.

By the adoption of some such system as that described, a considerable amount of expense should be saved. The cream cart which brings the cream to the factory could bring the samples at the same time, and the same cart could take back the empty bottles, so that they may be ready for use when the time for the next testing comes round. After a little time also it should be unnecessary to have a special person to visit the farms and take the samples, as this might well be done by the farmers themselves after one visit from the supervising official. A great deal of valuable time is now spent by the tester who visits the farms, and does the testing there, in the way of cleaning bottles, packing his machine, utensils, &c., and taking them from farm to farm, and his services are, as a rule, too valuable to be wasted in this fashion. Any small boy attached to the butter factory could do the bottle washing and packing up of the bottles to be returned. The wear and tear would also be considerably less, because the number of test-tubes and bottles broken should decrease considerably under a centralised system such as that referred to.

Sulla (*Hedysarum coronarium*).

In view of the many inquiries received by the Department recently, the following reports on trials made with this legume at the Experiment Farms should be of interest. At the suggestion of Mr. R. W. Peacock, Manager of the Bathurst Farm, 100 lb. of seed was obtained, through the Agent-General, from the Federazione Italiana dei Consorzi Agrari, Piacenza, Italy. It had been ascertained from Dr. Capra that this is a special strain of Sulla seed which has been selected for many years.

Portions of the seed were sent for trial to Bathurst, Wollongbar, and Grafton Farms.

The following are the reports :—

(1) Bathurst Experiment Farm.

Sulla was grown upon the uplands at this Farm and upon the irrigation area, during 1910 and 1911.

Upon the uplands it was sown at the same time as several varieties of lucerne. The season proved unfavourable, and too dry for a satisfactory growth of either lucerne or sulla. The initial growth of the sulla was scanty, and could in no way compare with the growth of the lucernes. Upon the light soil it did not appear to thrive, but on the richer soils of the uplands it did much better, and the early growth was satisfactory. After blooming it did not make a satisfactory second growth.

Upon the irrigation area the initial growth was satisfactory, and it was cut for hay. Since then the growth has been but little and unsatisfactory. It cannot be compared with lucerne as an irrigated perennial crop.

The general conclusions arrived at are that from a productive point of view it cannot compare with lucerne. It requires a rich soil and does not thrive upon light uplands with a limited rainfall. It may prove valuable upon rich soils as a quick-growing leguminous crop in a rotation, providing seed can be obtained cheaply.

(2) Wollongbar Experiment Farm.

The seed was sown on 7th December, 1910, in the experiment plots. The drills, fifteen in number, were 1½ chains long and 20 inches apart; manured with a fairly heavy dressing of bone-dust and sulphate of potash.

The seed germinated well, but some of it died soon afterwards and had to be resown. The growth up to the present (8th March, 1911) has been very slow.

The plants are leafy and low-growing, and at present there is no sign of flowering.

(3) Grafton Experiment Farm.

The seed was sown on 22nd October, on land in good state of cultivation and apparently free from weeds. Strips of red clover, crimson clover, Alsyke clover, and sainfoin were sown adjacent. All had germinated well on 31st October, but the land proved to be full of summer grass and couch, which completely smothered the slower-growing clovers, although mown off once. In moist seasons it would never do to sow clovers in the summer; the natural flora would always smother them. We should like to make an autumn sowing, as there would be greater probability of success at that season, or possibly in the spring.

Orchard Notes

W. J. ALLEN.

MAY.

Get ready for Planting and Pruning.

THE month of June is a favourable time for planting out deciduous fruit trees, and it would be well if the land is not already prepared to put it in order with the least possible delay. The area to be planted should be cleared, well fenced, and worked to an even depth. Ascertain the varieties of fruits which find most favour on the markets, then select such kinds as will thrive best in your soil and climate. Lay the orchard out properly, giving the trees plenty of room, so that there will be a sufficient area from which they will draw moisture to keep them in good growing condition during dry years. After planting, leave the trees well worked around, and apply a little mulch if available. Do every part of the work thoroughly, and you will not be disappointed in the ultimate results. Lime is beneficial to soils which are sour.

From now until pruning is a slack time, and it is well to give the orchard a rest until that time. Stable manure may be carted in for weak trees. Drains, fences, gates, or any repairs necessary may be attended to.

Lemons and mandarins will soon be ready for picking.

Pruning may be commenced towards the end of the month.

Bitter Pit.

The Cleopatra apples have been badly marked this year with the Bitter Pit, particularly where the crops have been light, as well as on strong-growing young trees. We have found that by allowing the trees to go practically unpruned they showed very little pit, while trees which were pruned were badly affected. I would, therefore, recommend a system of very light pruning for this variety.

Refilling Old Orchards.

Refills in deciduous orchards should be planted as early as possible.

Passion Fruit.

Keep the fruit picked up as it falls, as it is then in its best condition. Grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruit, it would be a good plan to send a few cases of passion fruit along in order to test their carrying quality, as, if we can successfully land this fruit on the markets of the Old World and get it well introduced there, there should be an unlimited demand for it. There are thousands of acres of land near the coast on which this plant does well, and where, with proper attention, it produces heavy crops of fruit annually. Unfortunately,

the trial shipments we have made up to the present have not all turned out satisfactorily, but we hope in time that the difficulties may be overcome, and that we may yet create a demand for this delicious fruit.

Nursery Stock.

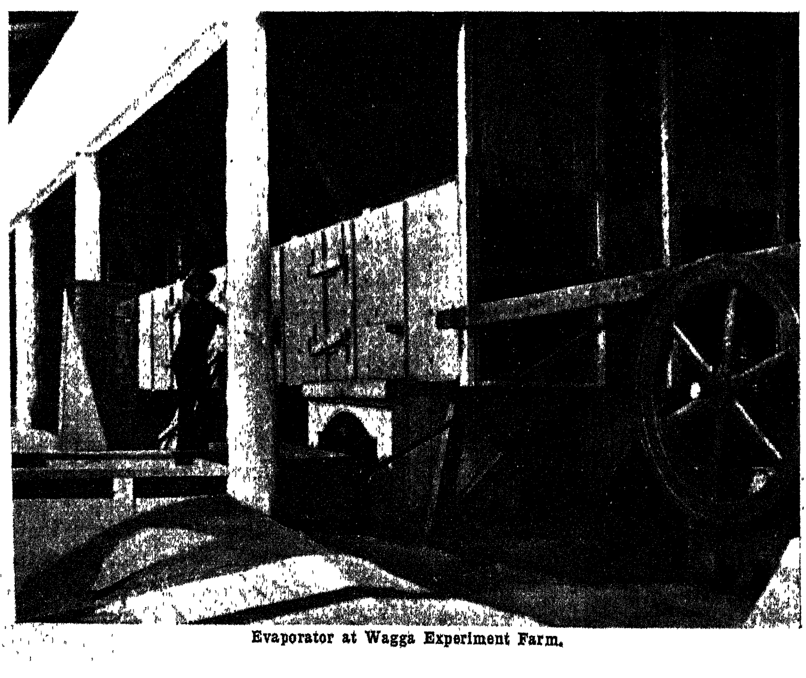
The wraps on all budded nursery stock may be removed any time now.

Wherever it is necessary to enclose the orchard with wire-netting and I am sorry to say that this is a precaution which cannot be overlooked in many parts of the State—it is best to use a good wide netting, with small mesh at the bottom, as it is wonderful through what a small mesh a young rabbit will get, as well as how high a fence he will scale. Therefore, if the orchardist wishes to preserve his trees from the attacks of these pests, he must see that the orchard is securely enclosed.

Fruit Fly.

Be very particular to pick up all fallen and infected fruit. Kerosene traps are excellent means for catching the fly. Shallow tins are preferable to deep ones. Saucers may be used if tins are not available. Mr. W. Freeman, orchardist, Agnes Banks, reports very good results with the kerosene traps.

I have to thank Mr. Brown, Mount Keira; Mr. Edgell, Bathurst; Mr. Moulder, Camden; Mr. Kincott, Eastwood; Messrs. Ray Brothers, Carlingford; and others, for sending me some very fine specimens of apples, pears, &c.



Evaporator at Wagga Experiment Farm.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ...	Pansy 4th (imp.).	Coff's Harbour ...	20 June, '11.
" ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
" ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
Guernsey ...	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Trevallyn... ...	20 Sept., '11.
" ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	....	10 Oct., '11.
" ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	....	3 Oct., '11.
" ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	30 June, '11.
" ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Billinudgel ...	1 Nov., '11.
" ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
" ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Singleton	22 Oct., '11.
" ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 July, '12.
Ayrshire ...	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
" ...	Royal Prince ..	Curly Prince ..	Rosie 5th ...	Grafton Farm ...	*
" ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
" ...	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ...	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

E

Department of Agriculture,
Sydney, 2nd May, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

SHORTHORNS.—Royal Pansy: sire, Royal Hampton X (imp.); dam, Australian Pansy; calved 8th December, 1909; colour, red roan. Price, **£50.**

Australian Pansy is by Airy Knight II from Pansy IV (imp.).

Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRE.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

WOLLONGBAR EXPERIMENT FARM.

AYRSHIRE.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS FOR SALE.

GRAFTON EXPERIMENT FARM.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£
Milkmaid ...	His Worship ...	Dairymaid II ...	6 July, 1905 ...	25
My Love	The Judge	Her Loveliness ...	19 March, 1904 ...	25

DEXTER-KERRY COWS FOR SALE.

HAWKESBURY AGRICULTURAL COLLEGE.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£ s. d.
Killarney ...	Waterville Punch	Aicme Close ...	....	16 16 0
Miss Ham II ...	,,	Miss Ham ...	24 August, 1907...	11 11 0
(A heifer) ...	,,	Judy Close ...	4 April, 1907 ...	11 11 0
,, ...	,,	,, ...	3 July, 1908 ...	11 11 0

H. C. L. ANDERSON,
Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agri culture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Luddenham A. and H. Society	F. Shawe	April 4, 5
Cooma P. and A. Association	C. J. Walmsley ...	,, 5, 6
Dorrigo A. Society	F. T. Stennett ...	,, 5, 6
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 5, 6, 7
Royal A. Society of N.S.W. (Sydney)...	H. M. Somer ...	,, 11–19
Corowa P., A., and H. Society (Horticultural Show)	J. D. Fraser ...	,, 12
Queanbeyan P., A., H., and I. Association	E. C. Hincksman	,, 12, 13
Batlow A. Society	G. F. Briggs ...	,, 19, 20
Bathurst A., H., and P. Association	A. H. Newsham...	,, 26, 27, 28
Hunter River A. and H. Association (West Maitland)	E. H. Fountain ...	,, 26–29
Richmond River A., P., and H. Society (Casino) ...	D. S. Rayner ...	May 3, 4
Orange A. and P. Association	W. Tanner ...	,, 3, 4, 5
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 4, 5, 6
Dubbo P., A., and H. Association	F. Weston ...	,, 10, 11
Dungog A. and H. Association	C. E. Grant ...	,, 10, 11
Coonamble P. and A. Association	J. M. Rees ...	,, 17, 18
Walgett P. and A. Association...	S. E. Johnston ...	,, 17, 18
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	,, 24, 25
Warren P. and A. Association	C. B. Egan ...	,, 24, 25
Brewarrina P. and A. Association	H. L. Cathie ...	June 7, 8
Hay P. and A. Association	G. S. Camden ...	July 11, 12
Trangie P. A. and H. Association	J. E. Reynolds ...	,, 12, 13
Deniliquin P. and A. Society	L. Harrison ...	,, 20, 21
Narrandera P. and A. Association	W. T. Lynch ...	Aug. 2, 3
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Riverina P. and A. Society (Jerilderie)	J. Kennedy ...	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton ...	,, 29, 30, 31
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Young P. and A. Association	G. S. Whiteman...	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart ...	,, 6, 7

Society.	Secretary.	Date.
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Ariah Park P., A., H., and I. Association	J. N. Taylor ...	,, 7, 8
Cowra P. A. and H. Association	J. T. Martin ...	,, 12, 13
Cootamundra A., P., H., and I. Association ...	T. Williams ...	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 12, 13, 14
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Canowindra P., A., and H. Association	G. Newmon ...	,, 19, 20
Temora P., A., H., and I. Association	W. H. Byrnes ...	,, 19, 20, 21
Ganmain A. and P. Association	J. H. Ashwood ...	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther...	Oct. 4
Lismore A. and I. Society	T. M. Hewitt ...	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd ...	,, 8, 9

1912.

Kiama A. Association	R. Somerville ...	Jan. 26, 27
Inverell P. and A. Association	J. McIlveen ...	Feb. 28–Mar. 2
Central New England P. and A. Association (Glen Innes).	G. A. Priest ...	Mar. 12, 13, 14
Yass P. and A. Association	W. Thomson ..	Mar. 27, 28

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VOL. XXII. PART 6 JUNE 2, 1911.

Agricultural Gazette of New South Wales.

The Realisation of the Aims of William J. Farrer, Wheat Breeder.*

GEO. L. SUTTON.

AT a meeting of this Association, held in 1898, the late William J. Farrer read a paper, in which he defined his aims and described the work he was doing in connection with "The Making and Improvement of New Varieties of Wheat for Australian Conditions."† That he did succeed with this work is now evident to everyone connected with the wheat or milling industry. Now that time has proved his success, it is fitting that some record of his work should be placed before this Association, which, thirteen years ago, listened to him define his aims and how he meant to achieve them.

Probably the most striking evidence of Farrer's success is the national popularity of the wheat Federation. It is unquestionably one of the most prolific grain varieties in cultivation, and certainly the most popular wheat in Australia to-day. It was purposely produced to suit the Australian method of harvesting with the stripper. Since its introduction to the farmers in 1903 its cultivation has spread by leaps and bounds. This has taken place as the result of sheer ability to yield well, and despite an unattractive appearance in the field. No other variety has, up to the present, been found to give such uniformly good results in all parts of Australia.

So general is its cultivation in some of the wheat districts that the aspect of the landscape at harvest time has actually been changed. No longer can the poets in such districts write about the "golden harvest tint," for when Federation is ripe it imparts the brown or bronze colour of its ears to the landscape. Such a transformation is probably unique in the history of wheat-growing.

A striking instance of the change effected was furnished last harvest. Mr. W. A. Gullick, our Government Printer, required for Great Britain some colour photographs of the "golden" harvest fields of New South Wales. To obtain these he sent his artist to take harvest scenes in the Cowra-Grenfell district. When the pictures, in their natural colours, were thrown on the screen to test them, it was found that the harvest fields in that district, due to the presence of Federation, were no longer "golden," but "brown." The British farmer is accustomed to a golden harvest. Pictures of a brown harvest would hardly convey to him an idea of fruitfulness; they would rather give colour to some of the extraordinary ideas which are said to be prevalent about Australia.

* Paper read before the Australian Association for the Advancement of Science, Sydney, 10 January, 1911.

† See *Agricultural Gazette* of New South Wales, Vol. IX, Feb., 1898, page 131.

The rapid increase in the area planted with Federation in the district referred to is typical of what has taken place in other districts; it can, in consequence, be referred to in detail. At the time the photos were taken it had only been known in the district for six years. It was first grown at Iandra, when 20 bushels of seed were sown on the farm of Mr. Rientz. At harvest-time its appearance was so much against it that it was deemed unsuitable. It, however, yielded better than it looked, and produced some 24 bushels per acre. Because it yielded so much better than its appearance indicated, Messrs. Freebairn Bros., on the same estate, planted about 84 bushels of seed on 130 acres for comparison with one of the best of the old varieties—Farmer's Friend. Just before harvest the appearance of Farmer's Friend indicated that it would outyield the new Federation. After harvest the results indicated that the new Federation had outyielded the old variety by some 8 bushels, the yields of the two varieties being respectively 37 and 29 bushels. The gross yield from the Federation paddock was 1,166 large bags and about 15 tons of hay. After such a victory Federation has never looked back; its progress has been a triumphant march, until now it is king throughout the whole of the district. It is estimated that there are now 15,000 acres of Federation planted on Iandra.

Another instance in the same district is worth recording. Two years after its introduction on Iandra an adjoining station, Brundah, had 3,000 acres planted with Federation. The average yield per acre from this area was 22 bushels. From the total area 13,040 bags (the old size of 4 bushels) were sold, the remainder being kept for seed the following year. It is probable that in New South Wales this was the largest area planted with any one variety. It is also probable that the yield furnished the largest average for a big area in the State.

It is significant that the winning varieties of "growing crop" competitions are invariably Federation. This year, in the Cowra district, the competing crops, each of not less than 30 acres, were all Federation. The average yields per acre of the three winning crops were respectively 41 bushels, 40 bushels, and 39 bushels.

In Victoria, Federation is also held in high esteem by the farmers. How important a factor the variety is to the wheat production of that State may be gathered from the statement of Dr. Cherry, the Vctorian Director of Agriculture. Writing at the end of 1909, he said:—

> The question of whether the present wheat harvest will realise the official forecast of 25,000,000 bushels depends, to a large extent, on the way that one variety of wheat, namely, Federation, may have stood the test of an unfavourable winter's growth. . . . Up to the present the returns are all in its favour. Returns of 20 bushels in the Mallee, and up to 35 bushels in the best parts of the Wimmera are being recorded. . . . So rapid has been the advance of the new variety (Introduced to Victoria in 1904.—G.L.S.) that probably one-fourth (¼) of all the wheat in Victoria this year is of the Federation variety. As the yield is at least 3 or 4 bushels to the acre above that of all other varieties, the benefit during the year from the work of the late Mr. Farrer may be estimated at 1,500,000 bushels of wheat, representing a cash value to the farmer of £250,000.

In South Australia, the success of Federation has been no less remarkable. The president of our section, W. Angus, Esq., B.Sc., when Director of the South Australian Department of Agriculture, wrote:—

> We are indebted to the work of the late Mr. Farrer, of New South Wales, for the best all-round variety of wheat now grown; one which is peculiarly suited to South Australian conditions, viz., Federation.
>
> Federation is a grain-producing variety, not a hay wheat, and there is probably no other variety to equal it in this respect. Not only is it a very high yielder, but it has the power of adapting itself to the different conditions of climate and soil, a most important factor in a country like Australia. In the hot, dry north, in the cool south-east, on the light, sandy soils of the Pinarroo and Loxton country, and on the heavier Salisbury Plains, we find Federation taking premier place amongst our varieties.

In the South Australian variety trials, in eight out of nine localities Federation had first place, being beaten in the other by its half-sister, Yandilla King.

From a popular standpoint, Federation is considered to be Farrer's greatest success; but it is by no means the only one of his productions that have proved successful. Other well-known varieties, now in general cultivation, are Bunyip, Bobs, Cleveland, Comeback, Jonathan, and Thew.

Early last year a conference of the officers of the New South Wales Department of Agriculture, who were specially interested in the cultivation of wheat, was held at the Wagga Wagga Experiment Farm. This conference selected seventeen varieties of wheat which could be recommended to the farmers as being most prolific and otherwise suitable for the various farm and agricultural requirements of this State. No variety was included in the list of those selected unless, by actual trials under farmers' conditions, it had proved consistently prolific, nor unless it was capable of producing flour of a certain standard strength. Twelve out of the seventeen varieties selected were Farrer's productions. This carries its own evidence of Farrer's success.

In 1909, under the supervision of the New South Wales Department of Agriculture, forty-three trials with varieties of wheat were undertaken by farmers in all parts of the State. To undertake this work indicates that these men were progressive. That nine of them were growing only Farrer varieties is therefore further proof of his success. The other thirty-four experimenters tried an old favourite in comparison with the Departmental productions. In thirty-two of the thirty-four trials the farmers' selection was beaten by one or more of the new wheats. This is additional proof of his success.

In his paper, read before this Association, Farrer defined his aims as being the production of wheats specially suitable for our peculiar climatic conditions, which should also be—

(*a*) of greater milling value than the old varieties; and
(*b*) more resistant to rust.

He required something more than to produce a prolific variety. His ideals were high. Perfection was his goal, though he recognised this as

being unattainable. Each success gave him something more to aspire to, and rendered perfection still further beyond his reach. It is fortunate for Australia that his ideals were lofty. To breed a wheat with no other recommendation than that, in a normal season, it would yield well, would have been comparatively easy, and would have quickly earned for him an enviable reputation. Such a policy was, however, too small and short-sighted for a man of his mental calibre. As the result of his forethought, Australia can now grow a *strong*, as well as a *white*, wheat, and she need not fear the disastrous effect of the ravages of a rusty season, as she did before Farrer's success was achieved and his aims were realised.

That he succeeded in producing prolific varieties, specially suitable for our climatic conditions, is proved by the increasing popularity of his cross-breds, and notably by that of Federation. That these varieties are also of superior milling value, and more rust-resistant than the old varieties, is proved in a less direct, but none the less convincing, way.

Actual tests in the Departmental laboratory, and in the commercial flour-mills, have shown that New South Wales, with the aid of such varieties as Comeback, Jonathan, and Bobs, can now dispense with the importation of the strong Manitoba wheat for blending with our soft wheats. The varieties referred to are equal in flour production to the old varieties, and equal in strength to the famed standard Manitoba wheats. Though not so generally suitable for our varying conditions as Federation, they have their place, and are decidedly suitable for cultivation in some districts. That they are grown in commercial lots is proved by the intention of the Chamber of Commerce to make a special standard for these varieties this year, under the name of "NEW SOUTH WALES STRONG WHITE." This indicates that New South Wales is likely to become an exporter of *strong* wheat instead of, as in the past, an importer of it. The local trade recognises the value of this class by paying premiums of 2d. to 6d. per bushel more for the wheats comprising it. The success achieved in this direction of improving the quality of our flour and bread would have been of far greater pleasure to Farrer—had he lived to realise it—than the success and popularity attending Federation, because of its ability to fill bags under so many varying conditions.

Mr. Guthrie's periodical tests of the f.a.q. standard sample of wheat indicate that it is gradually increasing in strength. It is possible, but unlikely, that this increase in strength has been due to seasonal characteristics. It is far more probable that it is due to the increasing quantity of Farrer's cross-breds now being harvested.

Because of the proved success of Farrer's varieties, the conference of Departmental officers previously referred to were able to exclude from the list of selected varieties any that had not a strength of 47, new estimation (50, old estimation). As the most popular of the old varieties—*e.g.*, Dart's Imperial and Purple Straw—had a strength of 44 or 45, the exclusion of such varieties meant that the standard of strength was raised at least two points. The economic value of this is, that the bread-producing

capacity of a 200-lb. sack of flour milled from varieties reaching the new standard has been increased by about 4 lb. There is an additional advantage in an improvement in the quality of the bread baked from such flour.

Most of the new varieties now grown are more rust-resistant, or early enough to be more rust-escaping, than the old varieties. If caught by a rusty season it is safe to expect that their resistance to the pest is sufficient to prevent the crop from being reduced from, say, 20 bushels to below 16, instead of to 4 or 5 of worthless grain, as was the case when many of the old varieties met with such a season.

Some varieties have, however, been produced (though the limit has not yet been reached) which are specially suitable for rusty districts. For several years past a variety called Thew has been successfully grown for hay at the Hawkesbury Agricultural College, where it was produced. At the College, the conditions favourable for the development of rust are present each season in a greater or less degree. This same variety has proved, in farmers' trials, very suitable for the coastal areas, at places where, because of the rust, it was deemed inadvisable to attempt to grow wheat, even for greenstuff.

At the Hawkesbury Agricultural College this year a new variety, called Warren, has quite eclipsed Thew with regard to its rust-resistance. The conditions prevailing this season were extremely favourable for the development of rust.

At Glen Innes, Jonathan for some years past has proved so highly rust-resistant that it has been a prolific yielder, and has produced grain equal in strength to the world's best. Last season, which was so exceptionally rusty that even the Fifes were badly affected, a new variety called Cedar was quite free from the pest, and produced grain of exceptional excellence. This variety, Cedar, is also a bunt-resistant, if not a bunt-proof variety. It is an instance of the later aims of Farrer in the direction of producing varieties resistant not only to rust, but to all the diseases to which wheat is liable.

From what has been stated it will be granted that Farrer achieved his aims in a remarkable degree. That one man should have accomplished so much, even in the space of a whole life-time, is a veritable triumph for scientific research, and patient and careful investigation. With the fruits of Farrer's success before us, his triumph, perhaps, does not now appear as great as it really is.

When he read his paper his ideas were popularly supposed to be those of a visionary, more interesting from a purely theoretical standpoint than from a practical or commercial one. How impossible his task seemed when it was undertaken may be gauged from the remarks made less than seven years ago by Mr. Martin Sutton, of the well-known seed firm of Sutton and Sons. Mr. Sutton's remarks are entitled to be taken as representing the leading commercial thought in the agricultural world. As head of the great seed firm, he could claim to have a special knowledge of what had been attempted

and what done in the direction of improving our cultivated plants. Mr. Sutton said:—

> We should be grateful to the botanists and scientific men who carry on these abstruse experiments in cross-fertilisation, but I would warn agriculturalists against expecting any practical results in our generation.*

He further maintained that he was supported in his contention by an eminent agricultural scientist, who stated that, "as a matter of fact, although he had watched wheat-crossings conducted by eminent men on the continent of Europe for twenty-five or thirty years past, he was not aware of any single variety which has yet come on the market."

Farrer, for one, has shown that this warning was unnecessary. He has realised his aims, as defined in 1898, almost to the full. The direct result of his work has been of incalculable value to the Commonwealth. In that it has indicated what is possible, and how to achieve the possible, the indirect result of his work will in the future be of still greater economic benefit.

No record of Farrer's success would be complete without—as he did, and would now wish to do—paying tribute to his co-worker, Mr. F. B. Guthrie, the Chemist of the Department of Agriculture. To Mr. Guthrie was left the task, by no means easy, of devising methods to reliably test the milling value of the very small samples of grain, which were the only ones available. The fact that these methods have furnished results which, when acted upon, have been confirmed by commercial experience, is the best proof of their efficiency, and the thoroughness with which they were devised. Fortunate indeed was Farrer that, in the early and critical stages of his investigations, he had in Mr. Guthrie such a sympathetic colleague. Without the sympathy and enthusiastic co-operation thus extended to him, Farrer would have been hampered, and would have been unable to have accomplished all that he has done.

ERRATUM.

ON page 299 of April *Gazette*, results are given of manurial trials with wheat in the southern district. The average yield of the unmanured plots is stated to be 20 bus. 44 lb. This is an arithmetical error; the figures should be 24 bus. 6 lb.

"The Quality of English Wheat"; *Journal of The Farmers' Club*, 1904.

Wheats at Bathurst Experiment Farm.

SEASON, 1910.

R. W. PEACOCK, Manager.

IN discussing the growth of crops, the rainfall and its distribution are amongst the most important factors.

The following table shows the precipitation during 1910 :—

1910.	Points.
6 January	21
11 ,,	360
12 ,,	43
13 ,,	17
14 ,,	42
15 ,,	60
16 ,,	12
21 ,,	23
22 ,,	87
28 ,,	17
29 ,,	31—713
11 February	25
27 ,,	32—57
7 March	108
8 ,,	2
9 ,,	1
12 ,,	29
13 ,,	116—256
19 April	46
26 ,,	4—50
18 May	20
19 ,,	97—117
4 June	3
12 ,,	8
13 ,,	7
19 ,,	2
20 ,,	26
21 ,,	3
22 ,,	2
23 ,,	42
24 ,,	4
25 ,,	9
29 ,,	72
30 ,,	40—218
2 July	6
3 ,,	3
6 ,,	14
8 ,,	2
9 ,,	12
12 ,,	4
14 ,,	6
15 ,,	3
17 ,,	6
18 ,,	2
19 ,,	40
20 ,,	16
23 ,,	10
24 ,,	1
28 ,,	4

1910.	Points.
29 July	2
30 ,,	1—132
2 August	9
10 ,,	18
19 ,,	8
20 ,,	5
31 ,,	14—54
1 September	9
4 ,,	32
6 ,,	4
11 ,,	2
16 ,,	4
17 ,,	47
23 ,,	3
24 ,,	7
28 ,,	22—130
2 October	11
3 ,,	4
5 ,,	60
6 ,,	2
10 ,,	1
11 ,,	5
21 ,,	72
22 ,,	5
26 ,,	1
29 ,,	53
30 ,,	1—215
5 November	4
7 ,,	7
12 ,,	21
21 ,,	1
22 ,,	8
23 ,,	1
25 ,,	3
29 ,,	4
30 ,,	2—51
1 December	64
4 ,,	10
9 ,,	12
11 ,,	1
12 ,,	48
13 ,,	84
16 ,,	3
18 ,,	12
19 ,,	3
31 ,,	17—254
Total	22·47 inches.

Notwithstanding the rainfall of 22·47 inches, the season must be classed as a comparatively bad one. The rainfall distribution was exceedingly faulty; 713 points fell in January and 254 points in December, leaving only 1,280 points for the intervening ten months.

The outstanding features of the season were a bad autumn, dry spring, mild early and midwinter, a very wintry October, with severe disastrous frosts and two falls of snow, the frosts continuing right throughout the month, and a very unseasonable one upon the 13th of November.

The following frosts were registered:—

7 October	4½ degrees	14 October	4 degrees
8 ,,	5 ,,	23 ,,	2 ,,
9 ,,	5 ,,	26 ,,	3 ,,
10 ,,	4½ ,,	27 ,,	3 ,,
12 ,,	7 ,,	31 ,,	1 ,,
13 ,,	3½ ,,	13 November	2 ,,

Snow fell on the 9th and 10th of October.

Cleveland Wheat, Bathurst Experiment Farm. Yield, 39 bushels per acre.

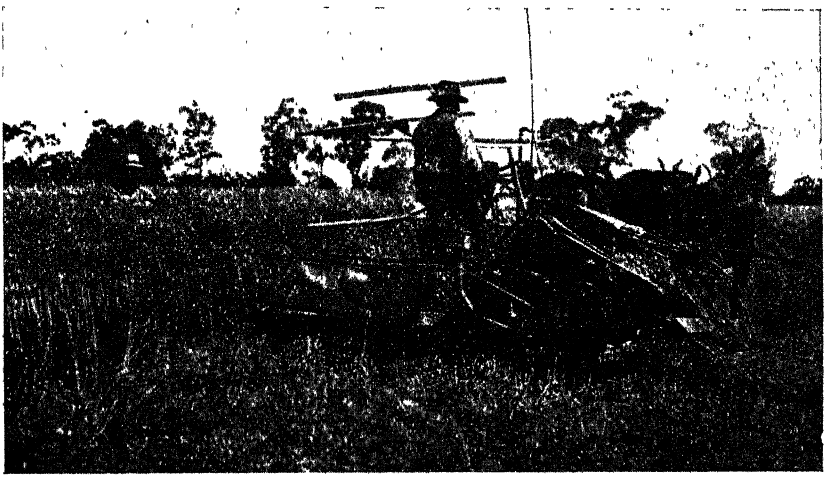
These wintry conditions experienced in what should have been the main month of spring, following on a comparatively mild winter, played havoc with some fruits, and also affected the wheats upon the lower portions of the farm.

Of the 713 points which fell in January, 360 points, or over half, fell in one torrential fall within four hours. This resulted in considerable waste as run-off, excepting where the land was specially prepared for its reception, and severe local floods were experienced.

Another feature of the season was the patchiness of the rainfall. To the east of Bathurst the January rains were not so torrential as in the northern,

western, and southern portions of the district. During the spring the south-western portion of the district also received some very timely storms not enjoyed by other portions.

The general character of the season was reflected in crops very much below the average. The official estimate of the yields is 10·18 bushels per acre for wheat. Many crops were not harvested, and a great many must have been garnered at a decided loss. There were a number of very good crops grown by farmers who had conserved a portion of the January rains to assist the meagre falls throughout the growing period. Most striking object lessons of the benefits of up-to-date methods were apparent throughout the district.



Bathurst Early Oats, Bathurst Experiment Farm. Yield, 49 bushels per acre.

The most critical period for the crops was during early November. Many received such a severe check during that month that they never recovered, and could not respond to the later rains. The conserved moisture from January allowed the crop upon fallowed land, or land ploughed during January after the preceding crop was harvested, to weather the dry period, and satisfactory returns were received.

The following are the returns from the various wheats grown on the demonstration area of this Farm:—

Paddock No.	Area.	Variety.	Total Yield.	Yield per acre.
	acres.		bus. lb.	bus. lb.
1A	6·33	Bunyip	119 54	18 56
2	17·30	Federation	511 25	29 33
2A	13·80	Cleveland	390 56	28 19
5	9·29	Bayah	208 46	22 28
Total	46·72		1,231 1	26 20

Of Federation, 10 acres yielded 35 bushels per acre, and 7·3 acres, 22 bushels per acre.

The unseasonable frosts seriously affected the Bunyip and also the Federation upon the lower land of the paddocks in which they were grown. Bayah also was grown upon low ground, and was considerably checked by frosts. The two mistakes made upon this area during this season were the choice of Bunyip and the treatment of the seed with bluestone and salt to prevent bunt. The salt appeared to very seriously affect the vitality of the grain upon soil of a certain class, representing the poorer portions of the farm. Upon such soil a proportion did not germinate, and the young plants appeared most unthrifty for a considerable time.

Both Federation and Bayah do not appear to be as suitable as Cleveland for the richer soils. Taking into consideration these defects, the average yield of 26 bus. 20 lb. was very satisfactory.

Of the varieties grown, Cleveland and Federation have again upheld their reputations for heavy yields. Cleveland in paddock 2B, over an area of 2¾ acres, which comprised a manure experiment, yielded an average of 39 bushels. One manured plot yielded at the rate of 44½ bushels per acre Adjacent to this wheat, and comparable with it, was Standwell barley, which yielded 55 bus. 21 lb. per acre, and Bathurst Early Oats, 49 bushels.

General Review.

The Bathurst district during the past nine years has experienced a very dry cycle—one decidedly below the average. Records are available for the past fifty-three years, the average rainfall for that period being 23·55 inches. In no instance has that average been reached during the period under review. The average rainfall for the past nine years, 1902 to 1910 inclusive, is 19·58 inches. The average rainfall for the nine years for the eight months, 1st April to 30th November, which may be taken as the growing period (this varies with the time of seeding and maturing period of the crop) is 11·93 inches.

The yields of wheats grown at this Farm and throughout the Police Patrol district of Bathurst are a reflex of the conditions, and also of the methods employed at this farm. The yields of the Bathurst District were supplied by the Government Statist. The yields of the farm crops for the first seven years of the nine were considerably reduced by many experiments and variety trials, the results of which are included. Those of the last two years are taken from the demonstration area of the Farm only, and represent solely crops grown upon commercial lines, and in this regard are more comparable with those of the district. The highest yields during the various years are also given, together with the varieties which yielded best.

The average wheat yield in Bathurst Police Patrol district for the nine years under review is 9 bus. 5 lb. per acre, and for Bathurst Experiment Farm, 20 bus. 57 lb. per acre.

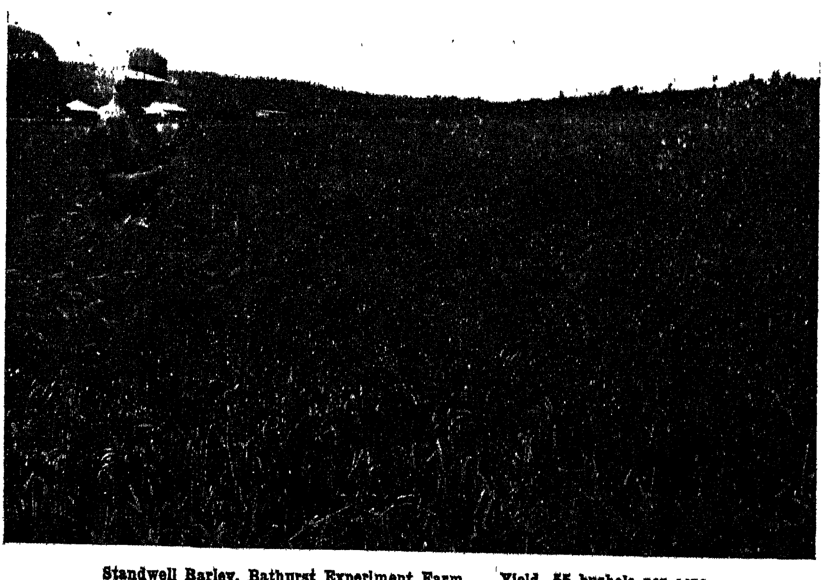
Year.	Rainfall.	Rainfall from 1 April to 30 Nov.	Average yield, Bathurst Police Patrol District. Wheat per acre.	Average yield, Bathurst Experiment Farm. Wheat per acre.	Highest yield, Bathurst Experiment Farm. Wheat per acre.	Varieties grown giving best returns each year.	Remarks.
	inches.	inches.	bus. lb.	bus. lb.	bus. lb.		
1902 ...	14·83	8·81	2 17	8 20	20 50* 23 20†	Hudson's Early Purple Straw, Steinwedel.	Disastrous drought.
1903 ...	21·68	13·83	20 4	26 30	39 0* 42 0†	Steinwedel, Bobs	A very satisfactory season.
1904 ...	18·26	12·32	6 4	24 35	38 30*	Tarragon, Cleveland.	
1905 ...	18·57	14·43	11 37	22 27	37 30*	Federation, Cleveland, Bobs ..	A very dry November.
1906 ...	22·89	14·58	15 5	26 0	37 45*	Dart's Imperial, Cleveland ..	Frosts seriously damaged most of the wheat
1907 ...	19·72	12·08	6 48	17 12	26 43*	Federation, Rymer.	
1908 ...	15·89	9·39	3 57	8 30	37 40*	Cleveland, Rymer	Late rains benefited the late wheats.
1909 ..	21·96	12·26	12 31	28 45	36 45*	Cleveland, Federation, Bobs ..	First year of Demonstration Area.
1910 ...	22·47	9·67	10 10 (preliminary estimate).	26 20	35 0‡ 44 30†	Cleveland, Federation	Rainfull distribution was very faulty.

* From field crop. † From experiment. ‡ From main crop.

As regards the varieties of wheats, it will be seen that the Farrer wheats have displaced the old varieties. Cleveland and Federation are the two favourites at the present time. Bobs is suitable for the late sowings. Of the old varieties, Dart's Imperial (also known as Chant's Prolific) is perhaps the best. Steinwedel also proved prolific, and is earlier than Dart's Imperial. In a district where the binder is mostly used, its fault of shedding its grain is not such a drawback as where strippers do the harvesting.

Throughout the nine years, good methods have ever given good returns. During the years of very light rainfall, the effect of this was strikingly apparent, and many valuable demonstrations of the old and new methods were given.

As the result of these years of experiment, demonstration, and observation, the practice which is recommended to farmers is a mixed system in which sheep have an important place in wheat farming—one that allows of a two-course rotation of fodder crop and wheat; one which provides a period of summer fallow of from five to six months, by which to conserve some moisture to augment the limited falls throughout the growing period; and one whereby fertility is sustained and weeds and diseases are kept in check. Such a system, if universally adopted throughout the district, would double the average yield per acre, and allow of the Bathurst Plains again taking a foremost place in the profitable agriculture of the State.



Standwell Barley, Bathurst Experiment Farm. Yield, 55 bushels per acre.

Crops at Wagga Experiment Farm, 1910.

G. M. McKEOWN, Manager.

THE prospects in the early part of the year were far from promising, owing to the light rainfall during the latter part of 1909 and the first part of 1910, only 790 points having been recorded during eight months ending 31st May. The preparation of land was, in consequence, rendered very difficult, and as that which had been fallowed was handed over for the purpose of increasing the experiment area, the whole of the farm crops had to be provided for by ploughing during the autumn.

The rainfall for the four months from the 1st February to the end of May was only 228 points; but as we had 1,257 points between 1st May and mid-November, the requirements of the growing period were fairly well met. Still the fall during May was only 85 points, so that very little seed germinated before June. Thus the stooling period of the later varieties was to some extent curtailed.

Paddock No. 5, which had borne in the previous season a crop of grain following a year under grass (which for some years has been annually alternated with a crop) was used for hay production. The variety used was Zealand. Seed was sown in March, after completion of ploughing, which was done by rotary discs from 7th February into the former month. The land was harrowed twice, and as the rainfall was light, it was rolled immediately after sowing. Seed was drilled at the rate of 44 lb. per acre, with 56 lb. of Shirley's No. 3 manure. The average yield was 2 tons per acre by measurement, the paddock being too far distant to allow of weighing on the weighbridge.

Paddock No. 6A, 27 acres, which in the previous year had been grassed, was ploughed early in April, harrowed twice, and rolled after sowing. Seed was sown at the rate of 40 lb., with 56 lb. of Shirley's No. 1 superphosphate, per acre. The growing crop was rolled in September. The variety of wheat sown was Marshall's No. 3, which yielded 24 bushels 54 lb. per acre.

Paddock No. 3, 90 acres, which bore a crop of rape in the previous year, fed off by sheep, was ploughed in May and harrowed twice. The growing crop was rolled in August. A portion of the paddock is occupied by a considerable depression, which forms a natural watercourse. The crop of Federation was to some extent reduced by the presence of this area. The higher portion returned 30 bushels, while the average from 70 acres was 23 bushels 37 lb. per acre. The highest yield of Federation in the experiment plots was 34 bushels. The rest of the paddock was occupied by Firbank wheat, which returned 19 bushels 25 lb. per acre, and Kinver malting barley, which yielded 37 bushels 6 lb. per acre. The Firbank variety

of wheat, which is usually a light grain yielder, on this occasion gave its highest recorded yield on the Farm. Shirley's No. 1 superphosphate was used at the rate of 56 lb. per acre.

Paddock No. 7, which last year returned 23 bushels 8 lb. of Zealand wheat, after a crop of maize had failed and left the land practically in a fallow condition, was again used for the same variety of wheat, the yield being 22 bushels 32 lb. per acre. Ploughing was done with rotary discs during the first week in April, and the land was harrowed once. Seed was sown 13th to 17th May, at the rate of 46 lb. per acre, with 56 lb. per acre of No. 1 superphosphate, and the land was rolled after sowing. The growing crop was rolled in August.

Paddock No. 4, 90 acres, which in the previous year had borne wheaten hay, cut when in flower, was disc ploughed in April and twice harrowed. Seed was sown in May, at the rate of 41 lb. per acre for Bunyip and 32 lb. for Zealand, with No. 1 superphosphate 56 lb. per acre. The crop was rolled in August. The yields were Zealand 16 bushels 29 lb., and Bunyip 14 bushels 47 lb. per acre. The crop in this paddock was to some extent reduced by exhaustion of moisture by eucalypts, which have been left for shade for stock.

Paddock No. 5A, 80 acres, which the previous year had been under grass, was ploughed with mould-boards early in June, and harrowed twice. Seed was sown before mid-June, with 56 lb. of No. 1 superphosphate per acre, as in other cases. The crop was rolled in September. Zealand, 23 acres, yielded 19 bushels 15 lb., and a similar area of Bunyip returned 20 bushels 2 lb. per acre.

Barley returned the following yields per acre:—

	bus.	lb.
Skinless	22	42
Kinver	37	6
Goldthorpe	32	42
Golden Grain	39	21
Gisborne...	19	39
World's Champion	17	43

The two last-named are new varieties.

In this paddock the lateness of sowing was largely counteracted by the good rainfall received in June.

Portion of paddock No. 2 was used for comparison of rough and smooth cultivation under dry conditions, but owing to the heavy rain which fell in June, it was of no value as a demonstration of the effects of fine against rough culture as intended to apply to dry conditions.

Both sections, each 25 acres, were first ploughed in March with mould-boards.

Section A was harrowed twice and disced twice before sowing, which was done in June after a good deal of rain.

Section B was allowed to remain unmulched after the first ploughing, and was again mould-board ploughed immediately prior to sowing, this being the only treatment given to it.

Both sections were sown simultaneously in June, the variety of wheat used being Comeback.

The yield from section A, the better cultivated area, was 20 bushels 36 lb., and from section B, 19 bushels 55 lb., the net value of the first being 5s. 8d. per acre above the latter, the cost of preparing Section B being greater.

The effect of the June rains before and after sowing was to melt down the clods which were in evidence in section B after the first ploughing, the second ploughing leaving the soil in comparatively fine tilth.

The following are details of rainfall for the year:—

	Points.		Points.
January	348	July	215
February	Nil.	August	62
March	137	September	187
April	Nil.	October	231
May	85	November	135
June	390	December	104
Total		... ...	1,894

Superphosphate.

It is of interest to compare the rainfall and average yields of the County of Clarendon for the years 1907 to 1909 with those of the corresponding years of the previous decade, 1897 to 1899. The average rainfall for the first triennial period was 15·09 inches, and the average yield 7·66 bushels; whilst the second period, with an average rainfall of 15·73 inches, gave an average yield of no less than 13·03 bushels.

It will thus be seen that, with very little more rain, the average crops in the neighbourhood of this Farm have been nearly doubled; and in individual cases, yields of nearly three times the old figures are being obtained. The causes of this great increase are mainly the use of moderate quantities of superphosphate, and better cultivation of smaller areas. Fallowing has, of course, contributed to the increased yields, but the use of superphosphate has been the predominant factor.

In 1897, when experiments were first made with superphosphate, very large quantities per acre were tried, and the cost of the manure was so heavy that no farmers were induced to follow the lead. But later on (in 1899) demonstrations were made at this Farm with moderate quantities, and they were so successful that farmers throughout the district have been shown every year since the way to obtain greatly increased yields at no great expense, and the example has been very extensively followed.

No wheat is sown on Wagga Farm without an application of from 40 lb. to 60 lb. of superphosphate per acre. A rotation of crops is practised, so that in three years a given area carries a green crop fed off by sheep, or a bare fallow, in addition to two wheat crops—one for hay and one for grain, or two for grain. But even on fallowed land in this district, the increased yields obtained fully justify the use of the manure.

Feeding Smutty Oaten Hay.

"R.A.H." has 50 tons of hay, made from Algerian oats, in which there is a good percentage of smut—say, one head in every ten. He asks whether the presence of the smut is very detrimental to the value of the chaff made from the hay for feed purposes.

The Chief Inspector of Agriculture states that the feeding value of the chaff is lower, and there is a risk of spreading the disease to oat crops grown after the hay has been fed to stock. The veterinary officers of the Stock Branch add that the continued feeding with smutty hay or corn may cause colic, abortion, and gangrene of the extremities.

This warning should be of value to many readers.

"Sweating" Wheat in the Stack.

Some experiments were recently conducted by the United States Department of Agriculture, to determine the effect of different methods of harvesting wheat upon the quality and market value of the grain, the object being to test the relative advantages of threshing from shocks (stooks) and from the stack. The stack-threshed wheat was found to contain less moisture, but to give greater weight per bushel (59 lb. as against 55·5 lb.). There was less loss in cleaning and milling, less bran, more "low grade" and shorts, but more straight flour.

Baking tests with the flour also showed a slight advantage in the stack-threshed wheat.

The report (Circular No. 68, Bureau of Plant Industry) states that these differences are due to the process of "sweating" which the wheat goes through in the stack. An explanation offered is that, after cutting, the straw contains sufficient plant food to keep the kernels growing for some time, transferring the nutriment to the grain and storing it as starch. Some heat is generated during the process, depending upon the amount of moisture present. Wheat cut in the hard-dough stage should not be stacked until cured in the shock for a few days, as the moisture may cause sufficient heat to produce "stack-burnt" wheat.

Wheat threshed without sweating in the stack will sweat in the bin, through a rearrangement of the chemical constituents of the kernels. It is not quite known whether the change is identical with that occurring in the stack, though the effect upon the milling and baking qualities is much the same; but the danger of "bin-burning" is much greater. Air cannot circulate in a large bin as it can in the stack, consequently the heat is retained in the wheat.

These tests were carried out on the Great Plains—a cold, elevated, but dry region. Our conditions are very different. Dry, ripened grain gives very little heat in "sweating." Threshing from the stooks is very rarely practised, the rival methods being stripping and reaping, the latter operation being followed by stacking and threshing. But the tests would seem to indicate an advantage in reaping and threshing; and this should be counted in balancing the claims of the rival methods.

Black Oats in Cultivation Areas

MARK H. REYNOLDS, Inspector of Agriculture.

THE prevalence of black oats in cultivation areas specially devoted to wheat, has reached large dimensions in this State. The subject of the control and eradication of this hardy species of plant life is of such import to the agriculturist, that a further contribution dealing with the peculiarities and control of the black oat will not be out of place.

Why is the Black Oat so difficult to eradicate?

The trouble begins and ends with the seed. The germ is well protected with the thick hard coat of the seed, and this coat or skin is covered with fine silky hairs. It is the thick skin and well-protected germ which cause the difficulty of extermination.

The grain needs a moister soil, and to be in contact with moisture for a longer period, than does wheat and many other thin-skinned grains, before it will germinate. The hairy nature of the seed covering especially tends to throw off moisture. In practice this statement is found correct, for light showers that quickly evaporate out of the soil have little effect towards causing germination in the oat, whilst other grains germinate freely.

Again, even with a fall of rain which would otherwise be sufficient to germinate black oats, they will not germinate if the soil is loosely packed; nor will they germinate if buried deeply in the soil.

The depth in the soil at which black oats will not germinate depends on the nature of the soil. On the subject as to what percentage of the oat seeds buried retain their vitality more information would be of interest. It has, however, been demonstrated that they may be buried up to a period of ten years, and a percentage will germinate when placed in suitable environment.

The hairy coat of the seed also survives the digestive operations of certain of our domesticated animals, examples of which are the horse and the ox. The former voids a larger percentage of uninjured seed than the latter. It is considered by some that the ox digests oat seeds, but I have secured oats staled by oxen and have germinated the same.

It will be readily conceded that the foundation of any system of eradicating oats from the soil—that is getting them to germinate, for the plants are easy to destroy—depends on:—

(1) Feeding the farm stock with oat-free fodder;
(2) Sowing grain, wheat, &c., free from black oats; and
(3) Bringing the oat seeds already in the soil within germinating distance of the surface.

The first and second of these foundation principles need no further comment.

Conditions favourable to the germination of Black Oats.

The Manager of one of our State Farms once invited farmers to make a sowing of black oats on an oat-free area, and he stated his ability to rid the soil of them in one season. The invitation was not accepted, but farmers were not convinced of the possibility of doing so. Given a sufficiency of moisture for an autumn sowing, and placing the black oats about 1 bushel to the acre, at a depth of about 2 inches, there is every probability of all the grains capable of germinating doing so. It is quite a different problem to contend with when the seed is at all depths up to 8 inches.

Methods practised by farmers and others in ridding land of Black Oats.

The most universal method amongst farmers is to turn the land over to pasture for two to five years, when wheat-growing is not profitable due to the prevalence of oats. The object aimed at is not attained by such a method.

Another favoured means is growing Algerian oats, and cutting the same for hay. This method is also faulty. There is no doubt that by continuing to grow hay crops, wheat or oats, for a number of seasons and cutting them before the black oat plants shed their seed, the trouble would be overcome. But we have to face this problem, viz., that the greater areas of our wheat lands are outside the range of profitable production of hay except in limited quantities. Thus such a method as a universal remedy is out of court.

In certain localities success in reducing the black oats has been attained by growing a winter fodder crop, such as rape, in alternate years, or once in three years. The value of this method is limited, because rape is not a successful proposition in many localities where wheat is grown, and further it occupies the land in certain localities at a time most suitable for germinating oats, viz., the autumn and winter.

When to operate.

I would suggest to farmers that they devote their energies in the eradicating of black oats to the period of the year during which they receive the greatest rainfall. If this occurs in the autumn or winter, then the best prospects occur for the speedy reduction of the pest.

I would advise that the best rainfall period be devoted to systematic cultivation, and that no crop be sown to hinder or minimise the success of the thorough working of the soil.

Of course, only a section of the farm could be operated on in any one season.

Suggested system of working.

First.—A shallow 3-inch cultivation with plough or disc cultivator, then well harrow.

Second.—When plant growth occurs, plough the greatest depth it is intended to cultivate before the succeeding crop is sown. Again harrow.

Third.—When plant growth shows above the surface of the soil again, plough or disc cultivate, but shallower than before, and harrow.

The harrow is necessary because black oats prefer a fine seed-bed.

Continue such treatment throughout the favoured rainfall period, and on no consideration plough deeper than before. When no further germination of oats takes place, keep the surface 3 inches of soil cultivated until the seeding time for summer or winter crops.

Other by no means unimportant considerations.

Sow whatever seeds is is desired to reap, as far as possible, when conditions of rainfall, heat, and soil are the most favourable to the variety in question. It is most essential that the seed be sown at the time most suited to its requirements. There is no doubt in my mind that any one species of plant—the seed sown sufficiently thick to have a preponderating influence, but not so thick as to affect the vigour of individual plants—having secured a good start, materially hinders the germination and growth of any other plant that has been handicapped in the race.

THE ROMNEY MARSH FOR NEW ENGLAND.

BROADLY speaking, New England conditions require a hardy breed of sheep. Especially is this the case where natural pastures are solely depended upon.

The Romney Marsh is the hardiest of all breeds. In most cases it has proved its suitability in New England, and, in fact, in all districts where the climate is cold and wet and the pastures swampy.

To maintain the hardiness of the Romney Marsh, the breed should be preserved in its pure state. But the purchase of pure-bred Romney Marsh ewes would probably be too expensive an item for the average farmer. The next best thing would be to purchase Romney Marsh cross ewes. Romney-Merino half-bred and three-quarter Romney bred ewes can often be purchased at a very reasonable figure. With the ewes there should be mated pure-bred Romney Marsh rams. This practice should be continued on to the progeny each year successively; but in order to guard against in-breeding and consequent degeneration, the Romney strain should be renewed by supplementing other rams of the Romney breed. The Romney Marsh, besides being a hardy sheep, combines a profitable fleece with fairly early maturity.—J. WRENFORD MATHEWS.

Field Experiments with Wheat.

GEO. L. SUTTON, Wheat Experimentalist.

Last season, at the Bathurst, Cowra, and Wagga Experiment Farms, a number of field experiments connected with the cultivation and manuring of wheat were carried out simultaneously, and on a uniform plan. By carrying out the experiments in this way, it will be possible to correlate the results, so that they can then be used to formulate principles of general application, in addition to furnishing information of special interest to the district in which the experiments are conducted.

Some of the experiments have been conducted at the Cowra Farm since its inception, and this year they are being planted at the new Farm at Nyngan.

The experiments comprise:—

I.—A variety trial, to determine the most suitable varieties of wheat for hay and grain for the districts in which the respective Farms are located.

II.—A seeding experiment, to determine the most profitable quantity of seed to sow at different periods of the planting season.

III.—A manurial trial, to determine the most suitable and profitable phosphatic fertilizer.

IV.—A manurial trial, to determine whether the direct application of a fertilizer is advisable or profitable on well-prepared land which has been kept in a state of fertility by a suitable rotation.

V.—A manurial trial, to determine the chemical needs of the soil, and also to determine the most suitable fertilizer for continuous application to the same land.

Additional details regarding these experiments will be given as each is dealt with. The special details relating to the conduct of these experiments at the respective Farms are supplied by the officers who carried out the experiments.

At each Farm, special areas or blocks have been set aside for these experiments. These blocks have been divided into plots, and are defined by permanent pegs, so that from these permanent pegs the boundaries of the different plots can be located. The plots thus become permanently defined, and during the whole course of the experiment, the plot receiving a definite treatment at the commencement of the experiment will receive the same treatment throughout the whole course of it. In addition, the exact history of any plot will be accurately recorded.

The system of cropping adopted has been planned in accordance with the rotations which previous experience indicates is likely to give the best results at the respective Farms.

The preparation and cultivation of the ground, and the cultivation of the growing crops, are uniform at any one Farm, but may vary at the different Farms. The practice in each case is such as the experience of the manager indicates as the most suitable for that Farm.

In planning the experiments and arranging the cultural details, care has been taken to reduce, as far as possible, the error likely to occur from soil and other variations. To further reduce errors due to soil variations, each experiment includes a number of "check" plots. In most cases every third plot is a check plot, with which the other plots can be compared. The yields of these "check" plots are the bases from which comparisons are made. To render comparisons easy, "natural" and "percentage" yields have been computed, as explained in the February issue of this *Gazette*.

The portion required for comparison was taken from the centre of the plots. The ends of the plots were always removed, and, in some cases, the outside edges also. This was done when the yields of such were likely to be affected by influences other than the treatment given to the plot.

The crops harvested for hay were cut when in full flower. The weight of such was taken when the material was thoroughly dry.

I.—TRIALS OF VARIETIES OF WHEAT.

Object:—To determine the most suitable varieties for hay and grain in the respective districts in which the experiment is planted.

In this experiment a number of varieties are compared with a standard or check variety which has proved itself suitable for the district.

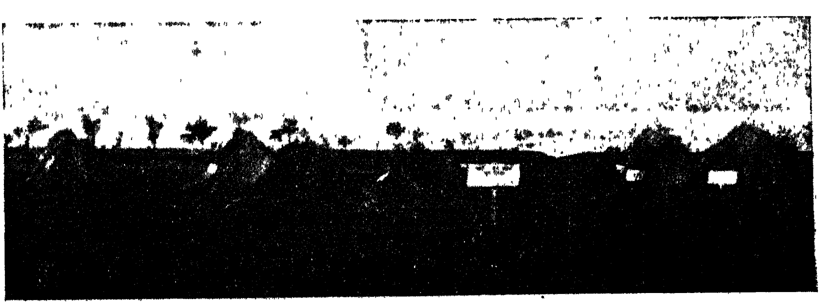
This experiment is divided into four sections. Two of these are sown at the beginning, a third in the middle, and the fourth at the end of the planting season.

One of the sections sown at the beginning of the planting season is fed-off with sheep at a suitable time. This is to determine how each of the different varieties will respond to or endure the practice of feeding-off.

WHEAT VARIETY TRIAL, COWRA EXPERIMENT FARM, 1910.

F. DITZELL, Experimentalist.

This experiment has been carried out in accordance with the general directions governing it at this and the other Experiment Farms.



Variety Trial with Wheats, Cowra Experiment Farm

The rotation adopted in connection with this experiment is a two-course one, in which wheat alternates with a fodder crop. Two blocks are, therefore, required. Those reserved are D II and III, and G I, II and III

This year blocks G I, II and III were occupied. Prior to the commencement of the experiment these blocks had been cropped and manured in a uniform manner, so that the land was in an even and suitable condition for the planting of this experiment. The land was cleared and broken up in 1906, and from then until the planting of this experiment it had been cropped as follows:—

1906...	...	Wheat without fertilizer.
1907...	..	Black tares (or vetches) to which a mixed fertilizer, composed of superphosphate 4 parts and sulphate of potash 1 part, was applied at the rate of 54 lb. per acre.
1908...	...	Wheat without fertilizer.
1909...	...	Black tares (or vetches) to which a mixed fertilizer, composed of superphosphate 4 parts and sulphate of potash 1 part, was applied at the rate of 64 lb. per acre.

Preparation of the Ground.

The preceding fodder crop (tares) having been fed off with sheep over the whole of the block, the land was disc cultivated in January. In February it was disc ploughed 5 inches deep and then harrowed. The land was then disc cultivated and harrowed when necessary until planting time, to maintain a loose mulch of dry earth about 3 inches deep, and to destroy all weed growth.

Planting.

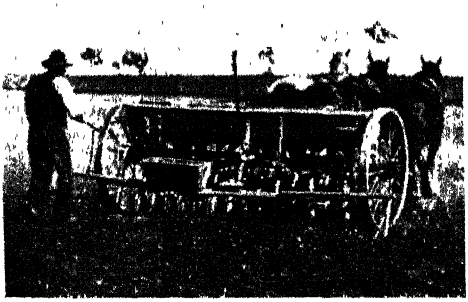
The different sections were arranged as per Sketch A (p. 487), and arrangements were made to plant each section as follows:—

(1) Early planting, fed-off; and

(2) Early planting, not fed-off, were to be planted from 23rd March to 7th April.

(3) Midseason planting was to be sown from 1st May to 14th May.

(4) Late planting was to be sown from 7th June to 20th June.



Sowing Experiment Plots, Cowra Experiment Farm

In each case a margin of fourteen days had been allowed, to afford that elasticity which is always necessary when plans for agricultural operations are being made. In every case this programme was adhered to.

The plots were 14·5 links wide, to accommodate the width of the drill.

Thirteen varieties, including the check variety, were sown, for details of which see Sketch B (p. 487).

To prevent bunt (smut) the seed was treated with bluestone, 2 per cent., and salt, 2 per cent.

The rate of seeding was about 42 lb. per acre.

No fertilizer was used.

After planting, the land was harrowed, to thoroughly cover the seed and prevent the soil drying out unduly. Whenever necessary to destroy a crust after rain, the growing crop was also harrowed.

Feeding-off.

Section (1) was fed-off rapidly and completely with sheep over the whole of the block on May 28th, 29th, and 30th, and was then harrowed.

Harvesting.

Before harvesting, the plots were reduced to $\frac{2}{41}$ of an acre in area, by cutting off the ends and the outside drills of the plots, thus eliminating outside influences. Half of each plot (= $\frac{1}{41}$ of an acre) was harvested for hay, the

Harvesting Experiment Plots, Cowra Experiment Farm.

remaining half being harvested for grain, and from these areas harvested the computed yields per acre have been worked out. For publication, the odd lb. in the hay yields have been discarded.

The portions of the plots required for hay were harvested by hand when in full flower, and immediately weighed to ascertain the green weights. The produce of each plot was then stooked opposite that plot, and was reweighed when thoroughly dry, this being the hay weight from which the yields per acre have been computed.

The remaining portions of the plots left for grain were harvested with the reaper and binder when the straw under the ear had turned yellow, immediately stooked on their respective plots, carefully labelled, and the sheaves tied

together to prevent disturbance by the wind. The grain was threshed directly from the stooks as soon as possible after it had matured, and from the weights thus obtained the yields per acre have been computed.

The Character of the Season.

The rainfall for 1910, as furnished by the records on the Farm, was as follows:—

		Points.	Points.
January	12	109	
	13	8	
	14	26	
	15	28	
	22	82	
	28	32	
	29	33	
			318
March	7	57	
	8	15	
	9	3	
	13	175	
	14	28	
			278
April	19	4	
			4
May	18	72	
	19	37	
			109
June	4	5	
	11	5	
	12	17	
	19	3	
	20	31	
	23	80	
	26	7	
	27	5	
	29	76	
	30	60	
			289
July	1	15	
	2	8	
	6	10	
	8	7	
	9	17	
	10	3	
	14	12	
	15	6	
	16	3	
	17	4	
	19	215	
	20	3	
	23	3	
	24	7	
	29	42	
	30	14	
			369
August	2	5	
	3	1	
	5	3	
	10	13	
	19	3	
	25	1	
	30	22	
			48
September	2	3	
	4	37	
	6	9	
	8	2	
	11	10	
	16	5	
	17	52	
	27	6	
	28	76	
			200
October	2	17	
	5	7	
	6	13	
	12	4	
	21	2	
	29	73	
	30	10	
			126
November	5	13	
	6	33	
	12	33	
	21	7	
	22	9	
	29	7	
			102
December	1	67	
	2	15	
	9	2	
	12	5	
	13	10	
	14	115	
	16	2	
	23	8	
	31	41	
			265
Total for Year			2,108

It will be noticed that, although good rains were experienced early in the year, the autumn was exceedingly dry, and that for one period of over nine weeks, between 14th March and 18th May, only 4 points of rain fell. This is unusual for this district.

When planting operations commenced, as a result of the cultivation methods adopted to maintain a surface mulch, there was a plentiful supply of moisture in the soil below a loose and dry surface mulch about 4 inches in depth. Unfortunately, the drill that was used failed to deposit the seed deep enough to take advantage of the moist ground below, with the result that in the early plantings the germination was uneven, and, therefore, unsatisfactory.

Although the midsummer planting was sown under similar conditions, good rains soon afterwards ensured a good germination.

The ground was in good condition and moist for the late planting, resulting in a good germination.

The rainfall during the winter months of June and July was plentiful. August was generally a dry month, whilst the remainder of the spring and early summer also had a good rainfall.

Frosts were experienced on the 8th, 9th, 10th, and 13th of October, and their effect upon the early sown crops is referred to later on.

Results.

The results are given in the tables that follow. As these results are from one year's experiments only, it is impossible to draw any definite conclusions from them, and the following deductions must be strictly regarded as being tentative only.

Table I.—From this table it appears that the majority of the varieties tried gave a better yield of hay when not fed-off than when fed-off.

Table II.—From this table it appears to be advisable to feed-off for grain.

In this case the effect of the feeding-off of one of the early planted sections has been to retard its growth somewhat, when compared with a similar early planted section not fed-off, thus enabling it to escape to a greater extent than did the latter the frosts that were experienced on October 8th, 9th, 10th, and 13th.

From these results the frosts evidently reduce the grain yields far more than they do the hay yields, if they reduce the latter at all.

Tables III to VIII.—These tables show the most suitable varieties for grain and for hay when sown at different periods in the planting season.

The percentage yields indicate the true relation between the yields of the different varieties.

Table IX.—An examination of this table will show the most suitable time to plant the different varieties for hay and for grain in this district.

The varieties, arranged in their order of merit, are as follow:—

VARIETIES ARRANGED IN ORDER OF MERIT.

For Hay.

Early planting.—Fed-off.	Early planting.—Not fed-off.	Midseason planting.	Late planting.
Bobs	Jumbuck	Warren	Zealand.
Zealand	Firbank	Cedar	Bunyip.
* Genoa	Genoa	Florence	Genoa.
* Florence	Bayah	* Bayah	Jumbuck.
* Bayah	Bobs	* Jumbuck	Firbank.
* Jumbuck	Cedar	* Firbank	Comeback.
Yandilla King	Warren	Yandilla King	Yandilla King.
Warren	Zealand	Zealand	* Bayah.
Firbank	Florence	Comeback	* Warren.
Comeback	Federation	Bobs	Federation.
Cedar	Comeback	Bunyip	Cedar.
Federation	Bunyip	Federation	* Bobs.
Bunyip		Genoa	* Florence.

For Grain.

Early planting.—Fed-off.	Early planting.—Not fed-off.	Midseason planting.	Late planting.
Yandilla King	Yandilla King	Warren	Firbank.
Warren	Warren	Yandilla King	Bayah.
Genoa	Genoa	Florence	Warren.
Bayah	Bobs	Firbank	Bunyip.
Federation	Bayah	Federation	Yandilla King.
Florence	Cedar	Comeback	Comeback.
Bunyip	Comeback	* Bayah	Bobs.
Comeback	* Federation	* Bobs	Cedar.
Zealand	* Jumbuck	Cedar	Florence.
* Firbank	Zealand	Bunyip	* Genoa.
* Bobs	Florence	Genoa	* Federation.
Jumbuck	Firbank	Jumbuck	Zealand.
Cedar	Bunyip	Zealand	Jumbuck.

* Equal.

Table X.—As the portions of the plots required for hay were weighed immediately they were harvested (green weight), and again when they were thoroughly dry, it is possible to ascertain the percentage of the loss of the green weight that occurred while each variety was being cured for hay. These percentages are given in Table X, a reference to which will show that the loss is influenced by the variety, the time of the season harvested, &c., the percentage lost ranging from 45 in Firbank, early planting not fed-off, to 73 in Bunyip in the same planting.

The average percentage lost for all the varieties in the early planting fed-off, is 58·7; in the early planting, not fed-off, 61·7; in the midseason planting, 60·3; and in the late planting, 62·8; thus giving an average for all the varieties and all the plantings of approximately 61.

The terms "natural" and "percentage" yields were fully explained by Mr. Sutton in the last February *Gazette* under "Tillage Experiments with the Plough," page 167.

Experiment I.—Variety Trial with Wheat, Cowra, 1910.

A. *General Sketch.*

(a)		(b)
Buffer.	DIVISION.	*Buffer.*
Early Planting, fed-off. Plots 1 to 10.		Early Planting, fed-off. Plots 1 to 10.
Buffer.		*Buffer.*
Early Planting, not fed-off. Plots 1 to 10.		Early Planting, not fed-off. Plots 1 to 10.
Buffer.		*Buffer.*
Midseason Planting. Plots 1 to 10.		Midseason Planting. Plots 1 to 10.
Buffer.		*Buffer.*
Late Planting. Plots 1 to 10.		Late Planting. Plots 1 to 10.
Buffer.		*Buffer.*

Approximate area occupied by experiment, 7 acres.

B. *Detailed Sketch of each Planting.*

(a)				(b)		
1.	Comeback. *Check.*		DIVISION.	Comeback.	*Check.*	1.
2.	Cedar.			Bunyip.		2.
3.	Bayah.			Federation.		3.
4.	Comeback. *Check.*			Comeback.	*Check.*	4.
5.	Warren.			Florence.		5.
6.	Genoa.			Jumbuck.		6.
7.	Comeback. *Check.*			Comeback.	*Check.*	7.
8.	Yandilla King.			Zealand.		8.
9.	Bobs.			Firbank.		9.
10.	Comeback. *Check.*			Comeback.	*Check.*	10.

Approximate area of each plot, $\frac{1}{13}$ acre.

TABLE I.

The effect that feeding-off has upon the hay yields of different varieties when planted early :—

Date planted—1*st April*, 1910.

Variety.	Early planting—Fed-off.		Early planting—Not fed-off.		Increase due to feeding-off.	Increase due to not feeding-off.
	Date harvested.	Computed yield per acre.	Date harvested.	Computed yield per acre.		
		t. c. q.		t. c. q.	t. c. q.	t. c. q.
Comeback ...	10 October ...	2 13 3	26 September	2 9 2	0 4 1	......
Cedar	5 ,, ...	2 16 3	26 ,,	3 7 0	.. ...	0 10 1
Bayah	5 ,, ..	3 3 1	4 October	3 18 0	. ...	0 14 3
Warren ...	11 ,, ...	3 0 3	1 ,,	3 0 0	0 0 3	. ...
Genoa	18 ,, ...	3 4 0	11 ,,	3 12 2	......	0 8 2
Yandilla King..	17 ,, ...	2 16 2	12 ,,	*	......	......
Bobs	12 ,, ..	2 16 0	30 September	3 16 2	......	1 0 2
Bunyip ..	3 ,, ...	1 16 2	23 August	1 16 3	......	0 0 1
Federation . .	12 ,, ...	2 2 0	3 October	2 11 1	.. ...	0 9 1
Florence ...	3 ,, ...	2 16 0	7 September	2 14 1	0 1 3	......
Jumbuck ...	24 ,, ...	2 19 0	11 October	4 1 1	.....	1 2 1
Zealand ...	24 ,, ...	3 7 0	25 ,,	2 9 0	0 18 0	......
Firbank ...	3 ,, ..	2 15 0	22 September	3 15 0	.....	1 0

* The weight of hay from the plot was not ascertained. However, Yandilla King, fed-off and not fed-off, gave the following yields of greenstuff per acre, respectively :—15,231 lb. (=6 tons 16 cwt.) and 20,848 lb. (=9 tons 6 cwt. 1 qr.), an advantage in favour of not feeding off of 5,617lb. (=2 tons 10 cwt. 1 qr.) which results, worked out on a hay basis, are 2 tons 16 cwt. 2 qrs and 3 tons 17 cwt. 1 qr. respectively from the fed-off and not fed-off plots, a difference in favour of not feeding off of 1 ton and 3 qrs. of hay.

TABLE II.

The effect that feeding-off has upon the grain yields of different varieties when planted early :—

Date Planted—1*st April*, 1910.

Variety.	Early planting—Fed-off.		Early planting—Not fed-off.		Increase due to feeding-off.
	Date harvested.	Computed yield per acre.	Date harvested.	Computed yield per acre.	
		bushels.		bushels.	bushels.
Comeback	11 November ...	25 1	9 November ...	19·2	5·9
Cedar	9 ,, ...	18·5	26 October ...	16·4	2·1
Bayah	19 ,, ...	31·1	16 November ...	16·7	14·4
Warren	19 ,, ...	33·5	16 ,, ...	24·3	9·2
Genoa	19 ,, ...	30·8	19 ,, ...	23·9	6·9
Yandilla King ...	19 ,, ...	39·0	16 ,, ...	25·3	13·7
Bobs	19 ,, ...	23·9	9 ,, ...	17 1	6·8
Bunyip	9 ,, ...	23·6	26 October ...	9·9	13·7
Federation	16 ,, ...	27·3	11 November ...	19·1	8·2
Florence	31 October ...	26·7	26 October ...	15 0	11 7
Jumbuck	19 November ...	20·5	11 November ...	19·8	·7
Zealand	24 ,, ...	23 2	24 ,, ..	19·1	4·1
Firbank	31 October ...	22·6	26 October ...	13·0	9·6

TABLE III.

The most suitable variety for hay for early planting in the Cowra district.

Date planted—1*st April*, 1910 ; *fed-off on* 28*th*, 29*th*, *and* 30*th May*, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre.	Natural yield per acre.	Per-centage yield.
			tons cwt. qrs	tons cwt. qrs.	
1*a*	Comeback ...	10 October ...	3 1 0	3 1 0	100
2*a*	Cedar	5 „ ...	2 16 3	3 0 0	95
3*a*	Bayah	5 „ ..	3 3 1	2 19 0	107
4*a*	Comeback	10 „ ..	2 17 3	2 17 3	100
5*a*	Warren	11 „ ..	3 0 3	2 18 1	104
6*a*	Genoa	18 „ ...	3 4 0	2 18 3	109
7*a*	Comeback	10 „ ...	2 19 1	2 19 1	100
8*a*	Yandilla King	17 „ ...	2 16 2	2 13 1	106
9*a*	Bobs	12 „ ..	2 16 0	2 7 0	119
10*a*	Comeback	10 „ ..	2 1 0	2 1 0	100
1*b*	Comeback	10 „ ...	2 12 1	2 12 1	100
2*b*	Bunyip	3 „ ..	1 16 2	2 10 3	72
3*b*	Federation	12 „ ..	2 2 0	2 9 2	85
4*b*	Comeback	10 „ ..	2 8 0	2 8 0	100
5*b*	Florence	3 „ ...	2 16 0	2 11 3	109
6*b*	Jumbuck	24 „ ...	2 19 0	2 15 2	107
7*b*	Comeback	10 „ ...	2 19 0	2 19 0	100
8*b*	Zealand	24 „ ..	3 7 0	2 16 3	118
9*b*	Firbank	3 „ ..	2 15 0	2 14 2	101
10*b*	Comeback	10 „ ...	2 12 1	2 12 1	100

TABLE IIIA.

The most suitable variety for hay for early planting, when not fed-off, in the Cowra district.

Date planted—1*st April*, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre.	Natural yield per acre.	Per-centage yield.
			tons cwt. qrs.	tons cwt. qrs.	
1*a*	Comeback	26 September	2 13 2	2 13 2	100
2*a*	Cedar	26 „	3 7 0	2 13 2	125
3*a*	Bayah	4 October	3 18 0	2 13 3	145
4*a*	Comeback	26 September	2 13 3	2 13 3	100
5*a*	Warren	1 October	3 0 0	2 11 0	117
6*a*	Genoa	11 „	3 12 2	2 8 1	150
7*a*	Comeback	26 September	2 5 2	2 5 2	100
8*a*	Yandilla King	12 October	....	2 10 0	......
9*a*	Bobs	30 September	3 16 2	2 14 3	139
10*a*	Comeback	26 „	2 19 1	2 19 1	100
1*b*	Comeback...	26 „	2 6 0	2 6 0	100
2*b*	Bunyip	23 August	1 16 3	2 7 3	77
3*b*	Federation	3 October	2 11 1	2 9 2	103
4*b*	Comeback	26 September	2 11 1	2 11 1	100
5*b*	Florence	7 „	2 14 1	2 7 2	114
6*b*	Jumbuck	11 October	4 1 1	2 4 0	185
7*b*	Comeback	26 September	2 1 0	2 1 0	100
8*b*	Zealand	25 October	2 9 0	2 2 0	116
9*b*	Firbank	22 September	3 15 0	2 8 3	172
10*b*	Comeback	26 „	2 5 2	2 5 2	100

TABLE IV.

The most suitable variety for grain for early planting in the Cowra district.

Date planted—1*st April*, 1910; *fed-off on* 28*th*, 29*th*, *and* 30*th May*, 1910.

Plot No	Variety.	Date harvested.	Computed yield per acre, in bushels.	Natural yield per acre, in bushels.	Percentage yield.
1*a*	Comeback	11 November	22·2	22·2	100
2*a*	Cedar	9 ,,	18 5	24·6	75
3*a*	Bayah	19 ,,	31·1	27·0	115
4*a*	Comeback	11 ,,	29·4	29·4	100
5*a*	Warren	19 ,,	33·5	27·9	120
6*a*	Genoa	19 ,,	30·8	26·4	117
7*a*	Comeback	11 ,,	24·9	24·9	100
8*a*	Yandilla King	19 ,,	39·0	25·93	150
9*a*	Bobs	19 ,,	23·9	26·97	89
10*a*	Comeback..	11 ,,	28·0	28·0	100
1*b*	Comeback	11 ,,	20·5	20·5	100
2*b*	Bunyip	9 ,,	23·6	22·33	106
3*b*	Federation	16 ,,	27·3	24·17	113
4*b*	Comeback	11 ,,	26·0	26·0	100
5*b*	Florence	31 October	26·7	24·97	107
6*b*	Jumbuck	19 November	20·5	23·93	86
7*b*	Comeback..	11 ,,	22·9	22·9	100
8*b*	Zealand	24 ,,	23·2	24·17	96
9*b*	Firbank	31 October	22·6	25·43	89
10*b*	Comeback	11 November	26·7	26·7	100

TABLE IVA.

The most suitable variety for grain for early planting, when not fed-off, in the Cowra district.

Date planted—1*st April*, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre, in bushels.	Natural yield per acre, in bushels.	Percentage yield.
1*a*	Comeback...	9 November	15·0	15·0	100
2*a*	Cedar	26 October	16·4	15 13	108
3*a*	Bayah	16 November	16·7	15·26	109
4*a*	Comeback...	9 ,,	15·4	15·4	100
5*a*	Warren	16 ,,	24·3	16·47	147
6*a*	Genoa	19 ,,	23·9	17·54	136
7*a*	Comeback...	9 ,,	18·6	18·6	100
8*a*	Yandilla King	16 ,,	25·3	16·96	149
9*a*	Bobs	9 ,,	17·1	15·33	111
10*a*	Comeback	9 ,,	13·7	13·7	100
1*b*	Comeback...	9 ,,	24·9	24·9	100
2*b*	Bunyip	26 October	9·9	23·76	41
3*b*	Federation	11 November	19·1	22·63	84
4*b*	Comeback...	9 ,,	21·5	21·5	100
5*b*	Florence	26 October	15·0	22·53	66
6*b*	Jumbuck	11 November	19·8	23·56	84
7*b*	Comeback	9 ,,	24·6	24·6	100
8*b*	Zealand	24 ,,	19·1	23·0	83
9*b*	Firbank	26 October	13·0	21·4	61
10*b*	Comeback	9 November	19·8	19·8	100

TABLE V.

The most suitable variety for hay for midseason planting in the Cowra district.

Date planted—10th *May*, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre.	Natural yield.	Percentage yield.
			tons cwt. qrs.	tons cwt qrs.	
1*a*	Comeback...	11 October	2 15 0	2 15 0	100
2*a*	Cedar	19 ,,	3 1 1	2 12 1	117
3*a*	Bayah	19 ,,	2 12 3	2 9 3	106
4*a*	Comeback...	11 ,,	2 7 1	2 7 1	100
5*a*	Warren	19 ,,	2 19 1	2 7 2	125
6*a*	Genoa	25 ,,	1 17 0	2 8 0	77
7*a*	Comeback...	11 ,,	2 8 1	2 8 1	100
8*a*	Yandilla King	25 ,,	2 10 0	2 8 0	105
9*a*	Bobs	19 ,,	2 6 3	2 7 2	98
10*a*	Comeback...	11 ,,	2 7 1	2 7 1	100
1*b*	Comeback...	11 ,,	2 9 3	2 9 3	100
2*b*	Bunyip	7 ,,	2 8 0	2 13 2	96
3*b*	Federation	22 ,,	2 6 0	2 10 0	92
4*b*	Comeback..	11 ,,	2 10 1	2 10 1	100
5*b*	Florence	12 ,,	2 14 2	2 9 3	110
6*b*	Jumbuck ...	25 ,,	2 12 0	2 9 0	106
7*b*	Comeback...	11 ,,	2 8 3	2 8 3	100
8*b*	Zealand	1 November	2 10 3	2 9 0	104
9*b*	Firbank	7 October	2 12 1	2 9 2	106
10*b*	Comeback...	11 ,,	2 9 3	2 9 3	100

TABLE VI.

The most suitable variety for grain for midseason planting in the Cowra district.

Date planted—10th *May*, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre in bushels.	Natural yield per acre in bushels.	Percentage yield
1*a*	Comeback...	19 November	26·1	26·1	100
2*a*	Cedar	19 ,,	25·3	25·84	98
3*a*	Bayah	24 ,,	25·3	25 57	99
4*a*	Comeback...	19 ,,	25·3	25·3	100
5*a*	Warren	24 ,,	30·1	25·07	120
6*a*	Genoa	24 ,,	17·1	24·83	69
7*a*	Comeback...	19 ,,	24·6	24·6	100
8*a*	Yandilla King	28 ,,	28·7	24·2	119
9*a*	Bobs	28 ,,	23·6	23·8	99
10*a*	Comeback...	19 ,,	23·4	23·4	100
1*b*	Comeback...	19 ,,	23·6	23·6	100
2*b*	Bunyip	9 ,,	20·5	23·47	87
3*b*	Federation	19 ,,	23 9	23·33	102
4*b*	Comeback...	19 ,,	23·2	23·2	100
5*b*	Florence ...	16 ,,	26·7	23·9	112
6*b*	Jumbuck ...	24 ,,	16·7	24·6	68
7*b*	Comeback...	19 ,,	25·3	25·3	100
8*b*	Zealand	24 ,,	16·1	24·84	65
9*b*	Firbank ...	16 ,,	26·3	24 37	108
10*b*	Comeback...	19 ,,	23·9	23·9	100

TABLE VII.

The most suitable variety for hay for late planting in the Cowra district.

Date planted—10th June, 1910.

Plot No.	Variety.	Date harvested.	Computed yield per acre.	Natural yield per acre.	Percentage yield.
			tons cwt. qrs	tons cwt. qrs	
1a	Comeback	19 October ...	2 1 1	2 1 1	100
2a	Cedar	25 ,, ..	1 14 1	2 11 3	86
3a	Bayah	25 ,, ...	1 14 0	1 18 2	89
4a	Comeback	19 ,, ...	1 17 0	1 17 0	100
5a	Warren	25 ,, ..	1 13 1	1 17 2	89
6a	Genoa	9 November	2 0 0	1 18 0	105
7a	Comeback	19 October ...	1 18 2	1 18 2	100
8a	Yandilla King	1 November	1 15 3	1 18 2	93
9a	Bobs	25 October ...	1 11 2	1 18 2	82
10a	Comeback	19 ,, ...	1 18 2	1 18 2	100
1b	Comeback	19 ,, ...	1 16 2	1 16 2	100
2b	Bunyip	22 ,, ...	2 4 3	1 16 2	122
3b	Federation	25 ,, ...	1 11 3	1 16 1	88
4b	Comeback	19 ,, ...	1 16 1	1 16 1	100
5b	Florence	24 ,, ...	1 10 3	1 17 2	82
6b	Jumbuck	1 November	2 0 0	1 19 3	103
7b	Comeback	19 October ..	2 0 1	2 0 1	100
8b	Zealand	9 November	2 10 2	1 18 0	133
9b	Firbank	24 October ..	1 16 2	1 15 3	102
10b	Comeback	19 ,, ...	1 13 3	1 13 3	100

TABLE VIII.

The most suitable variety for grain for late planting in the Cowra district.

Date planted—10th June, 1910.

Plot No.	Variety	Date harvested.	Computed yield per acre, in bushels.	Natural yield per acre, in bushels.	Percentage yield.
1a	Comeback	24 November	24·8	24·8	100
2a	Cedar	28 ,, ...	23·2	24·9	93
3a	Bayah	28 ,, ...	29·7	25·0	119
4a	Comeback	24 ,, ...	25 1	25·1	100
5a	Warren	... .	28·7	25·04	115
6a	Genoa	.. ..	18·8	24·97	75
7a	Comeback	24 November	24·9	24 9	100
8a	Yandilla King	....	24·9	24·47	102
9a	Bobs	28 November	22·6	24·03	94
10a	Comeback	24 ,, ...	23·6	23·6	100
1b	Comeback	24 ,, ...	25·3	25·3	100
2b	Bunyip	24 ,, ...	26·7	25·3	106
3b	Federation	28 ,, ...	19·1	25·3	75
4b	Comeback	24 ,, ...	25·3	25·3	100
5b	Florence	24 ,, ..	21·5	24·04	89
6b	Jumbuck	28 ,, ...	13·7	22·77	60
7b	Comeback	24 ,, ...	21·5	21·5	100
8b	Zealand	.. ..	15·4	21·63	71
9b	Firbank	24 November	26·7	21·77	123
10b	Comeback	24 ,, ...	21·9	21·9	100

Table IX.

The most suitable time to plant different varieties for hay and for grain in the Cowra district.

Variety.	Hay. Yield per acre. Early planting (fed-off). Planted 1 April. Fed-off 28, 29, 30 May.	Hay. Early planting (not fed-off). Planted 1 April.	Hay. Midseason planting. Planted 10 May.	Hay. Late planting. Planted 10 June.	Grain. Yield per acre. Early planting (fed-off). Planted 1 April. Fed-off 28, 29, 30 May.	Grain. Early planting (not fed-off). Planted 1 April.	Grain. Midseason planting. Planted 10 May.	Grain. Late planting. Planted 10 June.
	t. cwt. qr.	t. cwt. qr.	t. cwt. qr.	t. cwt. qr.	bus.	bus.	bus.	bus.
Comeback	2 13 3	2 9 1	2 9 2	1 17 3	25·1	19·2	24·4	24·0
Cedar...	2 16 3	3 7 0	3 1 1	1 14 1	18·5	16·4	25·3	23·2
Bayah	3 3 1	3 18 0	2 12 3	1 14 0	31·1	16·7	25·3	29·7
Warren	3 0 3	3 0 0	2 19 1	1 13 1	33·5	24·3	30·1	28·7
Genoa	3 4 0	3 12 2	1 17 0	2 0 0	30·8	23·9	17·1	18·8
Yandilla King	2 16 2	....	2 10 0	1 15 3	39·0	25·3	28·7	24·9
Bobs...	2 16 0	3 16 2	2 6 3	1 11 2	23·9	17·1	23·6	22·6
Bunyip	1 16 2	1 16 3	2 8 0	2 4 3	23·6	9·9	20·5	26·7
Federation	2 2 0	2 11 1	2 6 0	1 11 3	27·3	19·1	23·9	19·1
Florence	2 16 0	2 14 1	2 14 2	1 10 3	26·7	15·0	26·7	21·5
Jumbuck	2 19 0	4 1 1	2 12 0	2 0 0	20·5	19·8	16·7	13·7
Zealand	3 7 0	2 9 0	2 10 3	2 10 2	23·2	19·1	16·1	15·4
Firbank	2 15 0	3 15 0	2 12 1	1 16 2	22·6	13·0	26·3	26·7

TABLE X.

The percentage of the green weight of different varieties lost whilst being made into hay.

Variety.	Early planting (fed-off). Planted, 1st April, 1910. Fed-off, 28, 29, and 30 May, 1910. Date harvested.	Green weight.	Dry weight.	Per-centage lost.	Early planting (not fed-off). Planted 1 April, 1910. Date harvested.	Green weight.	Dry weight.	Per-centage lost.	Midseason planting. Planted, 10 May, 1910. Date harvested.	Green weight.	Dry weight.	Per-centage lost.	Late planting. Planted, 10 June, 1910. Date harvested.	Green weight.	Dry weight.	Per-centage lost.
		t. c. q.	t. c. q.			t. c. q.	t. c. q.			t. c. q.	t. c q.			t. c. q.	t. c. q.	
Comeback	10 Oct. ..	6 9 2	2 13 3	58	26 Sep. ..	6 17 2	2 9 2	64	11 Oct. ..	6 13 1	2 9 2	63	19 Oct. ..	4 19 2	1 17 3	62
Cedar	5 ,, ..	7 10 2	2 16 3	62	2€ ,, ..	8 11 3	3 7 0	61	19 ,, ..	7 5 2	3 1 1	58	25 ,, ..	5 6 0	1 14 1	68
Bayah	5 ,, ..	8 8 1	3 3 1	62	4 Oct. ..	9 14 1	3 18 0	60	19 ,, ..	6 1 0	2 12 3	57	25 ,, ..	5 7 1	1 14 0	68
Warren	11 ,, .	7 11 3	3 0 3	60	1 ,, ..	9 19 1	3 0 0	70	19 ,, ..	7 15 2	2 19 1	62	25 ,, ..	5 4 3	1 13 1	65
Genoa	18 ,, ..	7 8 1	3 4 0	57	11 ,, ..	9 4 3	3 12 2	61	25 ,, ..	4 15 1	1 17 0	61	9 Nov. ..	4 19 2	2 0 0	60
Yandilla King	17 ,, ..	6 16 0	2 16 2	59	12 ,, ..	9 6 1	....	..	25 ,, .	6 2 0	2 10 0	59	1 ,, ..	5 15 1	1 15 3	69
Bobs	12 ,, ..	7 7 2	2 16 0	62	30 Sep. ..	9 17 1	3 16 2	61	19 ,, ..	7 0 0	2 6 3	67	25 Oct. ..	4 11 3	1 11 2	66
Bunyip	3 ,, ..	4 11 2	1 16 2	60	23 Aug. ..	6 14 3	1 16 3	73	7 ,, ..	5 19 0	2 8 0	60	22 ,, ..	5 7 2	2 4 3	59
Federation	12 ,, ..	5 18 1	2 2 0	64	3 Oct. ..	7 16 2	2 11 1	67	22 ,, ..	4 19 0	2 6 0	54	25 ,, ..	4 9 3	1 11 3	64
Florence	3 ,, ..	6 13 1	2 16 0	58	9 Sep. .	8 8 1	2 14 1	68	12 ,, ..	7 12 0	2 14 2	64	24 ,, ..	4 6 0	1 10 3	64
Jumbuck	24 ,, ..	6 4 1	2 19 0	53	11 Ocr. ..	9 2 1	4 1 1	55	25 ,, ..	5 10 1	2 12 0	53	1 Nov. ..	4 16 2	2 0 0	59
Zealand	24 ,, ..	6 11 0	3 7 0	49	25 ,, ..	5 9 1	2 9 0	55	1 Nov. ..	6 10 0	2 10 3	61	9 ,, ..	5 6 0	2 10 2	53
Firbank	3 ,, ..	6 13 1	2 15 0	59	22 Sep. ..	6 16 1	3 15 0	45	7 Oct. .	7 10 0	2 12 1	65	24 Oct. ..	4 4 3	1 16 2	57
	Average percentage lost ..		..	58·7	Average percentage lost ..			61·7	Average percentage lost ..			60·3	Average percentage lost ..			62·5

WHEAT VARIETY TRIAL, BATHURST EXPERIMENT FARM, 1910.

R. G. DOWNING, Acting Experimentalist.

THE following experiments were carried out at the Bathurst Experiment Farm during the season 1910–11 on similar lines to those conducted at Cowra and the other farms.

The planting was done under the supervision of Mr. F. Ditzell, while the writer took charge of the harvesting and the other operations incidental to the latter.

The land on which the variety trial was planted had been "bare fallowed" during the previous year, and the paddocks in which the thick and thin seeding experiment and the two manurial trials were planted had been sown in 1909 with barley and rape and with oats respectively. Since 1898 the land had been planted with wheat and a suitable fallow crop in alternate years.

As the general outlines of these experiments are the same as those conducted at Cowra, and described elsewhere, it will be unnecessary to give a detailed explanation of method of planting, harvesting, &c.

In the case of the variety trial, the plots were 13·55 links wide, and at harvest-time the length was so regulated that $\frac{1}{25}$ acre was cut for hay and $\frac{1}{25}$ acre for grain.

It was originally intended to combine a feeding-off trial with the early planting of the variety trial; but owing to unforeseen delays at planting-time, the whole of the early planting had to be abandoned, and three sets of plots were then planted for the midseason planting. The same thing occurred in the case of the thick and thin seeding experiment, where, instead of early, midseason and late plantings, we had two midseason and one late planting.

The thick and thin seeding experiment was cut part for hay and part for grain, while the manurial trials were harvested for grain only.

The rainfall for the year 1910 is given by Mr. Peacock in another article in this issue—*vide* page 467.

TABLE I.

The following table shows the varieties in order of merit, but readers are warned that these are the results of one season's trial only:—

For hay.		For grain.	
Midseason planting.	Late planting.	Midseason planting.	Late planting.
Genoa	Uppercut	Genoa	Cleveland
Bobs	Cedar	Cleveland	Genoa
Thew	Warren	Federation	Warren
Warren	Bobs	Thew	Bobs
Uppercut	Federation	Comeback	Uppercut
Bayah	Bayah	Bayah	Federation
Federation	Thew	Uppercut	Cedar
Comeback	Bunyip	Cedar	Bunyip
Cleveland (check)	Genoa	Warren	Comeback
Cedar	Comeback	Bobs	{ Bayah
Bunyip	Firbank	Bunyip	{ Firbank
Firbank	Cleveland	Florence	*...........
Florence	Florence	Firbank	*...........

* The grain plots of Florence and Thew in the late planting were destroyed by sparrows; hence these two vacant spaces.

TABLE II.

Showing results, both for Hay and for Grain, of the Midseason Planting of the Variety Trial.

Variety.	Date harvested.		Computed yield per acre.		Natural yield.		Percentage yield.	
	For hay.	For grain.	For hay.	For grain.	For hay.	For grain.	For hay.	For grain.
	1910.	1910.	c. q. lb.	bushels	c. q. lb.	bushels		
Cleveland (*check*) ...	16 Nov....	19 Dec. ..	16 2 15	14·76	16 2 15	14·76	100	100
Bobs	7 ,, ...	5 ,, ...	18 1 12	10·46	16 3 15	15·04	108·7	69·5
Bunyip	2 ,, ...	5 ,, ...	15 2 24	10·6	17 0 15	15·32	91·6	69·2
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	17 1 16	15·6	17 1 16	15·6	100	100
Comeback	8 ,, ...	7 ,, ..	16 2 22	14·3	16 1 23	15·0	100·3	95·3
Cedar	10 ,, ..	7 ,, ...	15 0 3	11·5	15 2 3	14·4	96·8	79·8
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	14 2 11	13·9	14 2 11	13·9	100	100
Genoa	16 ,, ...	19 ,, ..	19 1 24	14·9	15 2 12	14·3	124·6	104·2
Bayah	3 ,, ...	7 ,, ..	17 0 3	12·7	16 2 14	14·7	102·4	86·4
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	17 2 16	15·1	17 2 16	15·1	100	100
Uppercut .. .	9 ,, ...	5 ,, ..	17 2 18	12·3	17 1 4	14·7	102·6	83·6
Firbank	2 ,, ..	5 ,, .	13 3 5	7·4	16 3 21	14·3	81·5	51·7
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	16 2 10	13·9	16 2 10	13·9	100	100
Federation ...	9 ,, ...	7 ,, ...	16 1 26	13·9	16 1 11	13·5	100·8	97·1
Warren	8 ,, ...	7 ,, ...	16 3 5	10·6	16 0 12	13·1	104·2	80·9
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	15 3 14	12·7	15 3 14	12·7	100	100
Florence	2 ,, ...	5 ,, ..	12 2 16	8·6	15 2 8	13·1	81·2	65·6
Thew	9 ,, ...	7 ,, ...	16 0 2	13·0	15 1 2	13·5	104·8	96·3
Cleveland (*check*) ...	16 ,, ...	19 ,, ...	14 0 8	13·9	14 0 8	13·9	100	100

TABLE III.

Showing results, both for Hay and for Grain, of the Late Planting of the Variety Trial.

Variety	Date harvested.		Computed yield per acre.		Natural yield.		Percentage yield.	
	For hay.	For grain.	For hay.	For grain.	For hay	For grain.	For hay.	For grain.
	1910.	1910.	t. c. q. lb.	bushels	t. c. q. lb.	bushels		
Cleveland (*check*)...	19 Nov....	24 Dec. ...	0 12 2 3	16·7	0 12 2 3	16·7	100	100
Bobs	15 ,, ...	9 ,, ...	0 15 1 11	13·4	0 13 1 3	16·49	115·5	81·3
Bunyip	10 ,, ...	7 ,, ...	0 14 3 10	11·1	0 14 0 3	16·3	105·7	68·2
Cleveland (*check*)...	19 ,, ...	24 ,, ...	0 14 3 4	16·1	0 14 3 4	16·1	100	100
Comback	15 ,, ...	15 ,, ...	0 17 3 7	11·8	0 17 0 18	18·13	103·7	65·2
Cedar	15 ,, ...	15 ,, ...	1 2 3 22	14·2	0 19 2 4	20·16	117·4	70·2
Cleveland (*check*) ..	19 ,, ...	24 ,, ..	1 1 3 19	22·2	1 1 3 19	22·2	100	100
Genoa	19 ,, ...	15 ,, ...	1 0 2 21	17·6	0 19 3 19	20·35	103 8	86·4
Bayah	15 ,, ...	15 ,, ..	1 0 1 26	12·1	0 17 3 19	18·51	114·3	65·2
Cleveland (*check*)...	19 ,, ...	24 ,, ...	0 15 3 18	16·7	0 15 3 18	16·7	100	100
Uppercut	15 ,, ...	15 ,, ...	1 1 2 7	14·2	0 16 3 2	17·69	128·5	80·1
Firbank	10 ,, ...	15 ,, ...	0 18 0 25	11·5	0 17 2 14	18·72	103·4	61·5
Cleveland (*check*)...	19 ,, ...	24 ,, .	0 18 1 26	19·7	0 18 1 26	19 7	100	100
Federation ...	15 ,, .	15 ,, ..	0 17 1 0	13·6	1 0 0 2	19·22	115·1	70·8
Warren	15 ,, ...	15 ,, ...	0 18 2 27	15·8	1 1 2 7	18·71	115·7	84·0
Cleveland (*check*)...	19 ,, ...	24 ,, ...	1 3 0 11	18·2	1 3 0 11	18·2	100	100
Florence	10 ,,	Rejected—These two plots were almost totally destroyed by sparrows.	0 17 3 7	...	1 1 0 15	...	84·2	...
Thew	15 ,,		1 1 3 2	...	0 19 0 18	...	113·5	...
Cleveland (*check*)...	19 ,, .	24 Dec. ...	0 17 0 22	21·1	0 17 0 22	21·1	100	100

WHEAT EXPERIMENTS AT WAGGA EXPERIMENT FARM, 1910.

R. W. McDIARMID, Experimentalist.

THESE experiments have been planned to permanently occupy two paddocks, each 45 acres in area. The soil is typical of a large area of the district, and the results obtained at the expiration of a number of rotations should enable us to formulate a practice which can be recommended to the farmers of the district with a certain amount of reliance. The paddocks have been divided into three sections, in order to carry out the experiments in accordance with the following three-course rotation:—

Wheat.
Fodder crops.
Fallow.

Preparation of Ground.

The preparation of the ground for all the experiments has been uniform, and consisted of :—

(1) Disc ploughed and harrowed, December, 1909, and January, 1910.
(2) Disc ,, ,, 12th to 22nd April, 1910.
(3) Disc cultivated, 29th April to 4th May, 1910.

The autumn was very dry, and the extra working was required to reduce the soil to a suitable condition to receive the seed.

Treatment of Seed.

Following up the results obtained at Cowra Experiment Farm in experiments dealing with different methods of treating the seed, bluestone and salt was used throughout the experiments. The solution used consisted of 2 lb. coarse salt and 2 lb. bluestone, dissolved in 10 gallons water, the seed being immersed for five minutes.

The germination in nearly every plot was very good. In the manure experiments it was thin, but this was probably due to the rough seed-bed at planting time, and not to the treatment.

Arrangement of Plots.

The plots of each experiment have been permanently pegged, so that during each phase of the experiment, the plants will be located on, and the manures applied to, the exact piece of ground used in the previous year or years. This should, at the close of a number of complete rotations, enable definite information to be gathered as to the effect of continually treating each plot in its respective manner, and should lead us to the best methods to be adopted.

Manuring.

Experiments I and II were manured at the rate of 56 lb. of superphosphate per acre. In experiments III, IV and V, the plots were manured according to the details of each experiment, the manures being previously mixed with fine earth to enable the required amounts of each per acre to be evenly distributed throughout each plot.

Seeding.

The seed sown in experiments I, III, IV, and V, was at the rate of 30 lb. per acre.

Treatment during Growth.

The plots of all the experiments were rolled on 16th August, but the conditions were not suitable for harrowing immediately afterwards. On 2nd September the late planted sections only of experiments I and II were harrowed.

Harvesting.

The harvesting for hay in all cases was done during the flowering stage. Many plots had to be cut by hand, but in each instance the length of the cut was as near as possible to that of the reaper and binder.

Before harvesting any of the plots, a portion from each end was removed, and in the late planted sections of experiments I and II, the outside drills were removed and rejected, in order to cut off from the area considered the influence on the crop of the inequalities in starting and lifting the drill at each end, as well as that of the unplanted divisions between the plots.

Weighing Hay.

In experiments I and IV the green weight of the product of each plot was taken immediately after cutting, in order to ascertain the loss in curing. Unfortunately much reliance cannot be put on the results, for the drying conditions were very unfavourable and different for nearly every plot.

Calculating Yields.

In calculating the yield of plots, when the outside drills were not rejected, owing to the influence of the unplanted divisions on the growth, the divisions were included in the area of each plot.*

In the late-planted sections of experiments I and II, the outside drills were rejected, and the area of each plot calculated accordingly.

WHEAT VARIETY TRIAL, WAGGA EXPERIMENT FARM, 1910.

Object:—To determine the most suitable varieties of wheat for the Wagga district, both for hay and grain, when—

(1) Planted early and fed-off.
(2) ,, ,, not fed-off.
(3) ,, midseason.
(4) ,, late.

The experiment was commenced too late in the season to make the early plantings; hence midseason and late sowings only were made. Sections I, II and III were planted midseason, and Section IV planted late.

The trial consisted of thirteen varieties, one variety acting as a check to the others, and being planted alongside of every other variety. The arrangement of the plots is shown in Plan A.

* A different system has been adopted at Cowra and Bathurst. See above.—G.L.S.

Plan A.—Showing arrangement of plots in Wheat Variety Trial, Wagga Experiment Farm, 1910. Size of plots—one cut of drill wide; 10 chains long.

		Buffer Plot.
1	*Check.*	Zealand.
2		Firbank.
3		Bunyip.
4	*Check.*	Zealand.
5		Florence.
6		Bobs.
7	*Check.*	Zealand.
8		Federation.
9		Bayah.
10	*Check.*	Zealand.
11		Warren.
12		Comeback.
13	*Check.*	Zealand.
14		Cedar.
15		John Brown.
16	*Check.*	Zealand.
17		Marshall's No. 3.
18		Rymer.
19	*Check.*	Zealand.
		Buffer Plot.

Harvesting.

In harvesting, Section II was cut for hay, Sections I and III for grain, and Section IV for hay and grain.

The appended tables show the results.

TABLE I.—Grain Results from Experiment I, Wheat Variety Trial, Wagga Experiment Farm, 1910.

Midseason Planted—23rd May, 1910. Late Planted—15th June, 1910.

Area of plots harvested—931 links x 14 links = ·13034 acre. Area of plots harvested—942 links x 4·54805 links = ·04284 acre.

Plot.	Variety.	Midseason planted.												Late planted.			
		Section I.				Section III.				Average, Sections I and III.				Section IV.			
		Plot.	Computed per acre.	Natural.	Percentage.	Plot.	Computed per acre.	Natural.	Percentage.	Plot.	Computed per acre.	Natural.	Percentage.	Plot.	Computed per acre.	Natural.	Percentage.
		lb.	bushels.	bushels.		lb.	bushels.	bushels.		lb.	bushels.	bushels.		lb	bushels.	bushels.	
1	Zealand (*check*) ..	197	25·18	25·18	100·	206	26·33	26 33	100·	201·5	25·75	25·75	100·	61	23·74	23·74	100·
2	Firbank	209	26·72	25·1	106·45	190	24·3	25·53	95·18	199·5	25·51	25·31	100 86	60	23 35	23·48	99·44
3	Bunyip.. ..	213	27·23	25·01	108·88	222	28·38	24 72	114·81	217·5	27·8	24·86	111·84	67	26·07	23 22	112 27
4	Zealand (*check*) .	195	24·93	24·93	100·	187	23 92	23·92	100·	191·	24·42	24·42	100·	59	22 95	22 95	100·
5	Florence	195	24·93	25 01	99·68	219	28·	24 13	116·04	207·	26 46	24 57	107 86	71	27 62	22 82	121 03
6	Bobs	205	26·22	25·1	104·46	209	26·72	24·34	109·78	207·	26·47	24 72	107·12	64	24 9	22 7	109 69
7	Zealand (*check*) ..	197	25 18	25·18	100·	192	24 55	24·55	100·	194·5	24·86	24·86	100·	58	22 57	22 57	100
8	Federation	266	34 02	25·27	134·62	247	31 58	24·	131·58	256·5	32 8	24·63	133·1	73	28·4	22 18	128 04
9	Bayah	196	25·07	25 36	98·85	203	25·95	23·44	110·71	199 5	25·51	24 4	104 78	67	26·07	21·79	119·64
10	Zealand (*check*) ..	199	25 45	25·45	100·	179	22 88	22·88	100·	189·	24 16	24·16	100·	55	21·4	21·4	100·
11	Warren	184	23·53	25·71	91·52	200	25·57	24·03	106·41	192·	24 55	24·87	98·96	52	20 23	21·27	95·11
12	Comeback	200	25·57	25·96	98 5	221	28·27	25·18	112·27	210·	26 92	25·57	105 38	56	21·78	21·15	102 98
13	Zealand (*check*) ..	205	26·22	26·22	100·	206	26·33	26·33	100·	205·5	26·27	26 27	100·	54	21 02	21 02	100·
14	Cedar	201	25·7	26·35	97·53	196	25 07	25 48	98·39	198·5	25·38	25·91	97·96	66	25·68	21·54	119 22
15	John Brown	208	26 6	26·47	100·5	197	25·18	24·63	102·23	202 5	25·89	25·55	101·36	54	21 62	22 66	95 28
16	Zealand (*check*) ..	208	26·6	26 6	100·	186	23 78	23 78	100	197·	25·19	25·19	100·	58	22·58	22 58	100
17	Marshall's No. 3 ..	212	27·12	25·96	104·46	241	30·62	24·71	123·91	226·5	28·87	25·33	114·18	70	27·23	21 54	126 42
18	Rymer	208	26·6	25·32	105·05	238	30·43	25·54	119·14	223·	28·51	25·43	112·09	68	26·45	20·5	129 02
19	Zealand (*check*) .	193	24 68	24 68	100·	207	26·47	26·47	100·	200·	25·57	25 57	100·	50	19·45	19·45	100

TABLE II.—Hay Results, Experiment I, Wheat Variety Trial, Wagga Experiment Farm, 1910.

Midseason Planted—23rd May, 1910. Late Planted—15th June, 1910.

Area of plots harvested—931 links × 14 = ·13034 acre. Area of plots harvested—942 links × 4·54805 links = ·04284 acre.

Plot.	Variety.	Midseason planted.									Late planted.						
		Date.			Weight per plot.		Percentage loss in drying.	Yield.			Date.			Yield.			
		Flowered.	Harvested.	Weighed.	Green.	Dry.		Per acre.	Natural.	Percentage.	Flowered.	Harvested.	Weighed.	Per plot.	Per acre.	Natural.	Percentage.
		1910.	1910,	1910.	c. q. lb.	c. q. lb.		t. c. q. lb.	t. c. q. lb.		1910.	1910.	1910.	c. q. lb	t. c. q lb	t. c. q. lb.	
1	Zealand (*check*) ..	31 Oct.	11 Nov.	8 Dec.	16 1 8	8 0 25	49·6	3 3 0 10	3 3 0 10	1 00	5 Nov.	16 Nov.	9 Dec.	1 3 14	2 3 3 2	2 3 3 2	100
2	Firbank	5 ,,	19 Oct.	16 Nov.	11 1 10	5 0 2	55·7	1 18 2 0	3 3 3 0	60 39	18 Oct.	26 Oct.	16 Nov	1 3 1	2 1 0 6	2 5 0 18	90·91
3	Bunyip	30 Sept.	13 ,,	16 ,,	9 1 0	3 0 13	66·3	1 3 3 18	3 4 1 19	37 12	14 ,,	26 ,,	16 ,,	1 1 17	1 12 2 25	2 6 2 5	70·31
4	Zealand (*check*) .	31 Oct	11 Nov.	8 Dec.	..	8 1 26	..	3 5 0 9	3 5 0 9	100	5 Nov.	15 Nov.	9 Dec.	2 0 6	2 7 3 21	2 7 3 21	100
5	Florence	6 ,,	22 Oct.	18 Nov.	13 0 0	5 3 9	55·1	2 4 2 26	3 4 1 14	69·49	18 Oct.	26 Oct.	24 Nov.	1 2 18	1 18 3 2	2 5 0 2	86·12
6	Bobs	24 ,,	7 Nov.	7 Dec.	15 1 20	6 3 9	55·7	2 12 1 17	3 3 2 18	82·31	31 ,,	9 Nov.	....	1 2 21	1 19 1 16	2 2 0 12	93·56
7	Zealand (*check*) ..	31 ,,	11 ,,	8 ,,	....	8 0 23	.	3 2 3 23	3 2 3 23	100	5 Nov.	15 ,,	9 Dec	1 2 20	1 19 0 21	1 19 0 21	100
8	Federation ..	18 ,,	21 Oct.	24 Nov.	15 2 16	6 0 16	60·7	2 7 0 15	3 0 3 24	77·33	26 Oct.	8 ,,	6 ,,	1 1 11	1 11 1 25	2 0 2 21	77·3
9	Bayah	20 ,,	2 Nov.	24 ,,	14 3 14	6 0 11	59·3	2 6 3 4	2 18 3 26	79·32	28 ,,	8 ,,	6 ,,	1 1 8	1 10 3 11	2 2 0 27	73 03
10	Zealand (*check*) .	31 ,,	11 ,,	8 Dec.	....	7 1 20	..	2 16 3 27	2 16 3 27	100	5 Nov.	14 ,,	9 ,,	1 3 14	2 3 3 2	2 3 3 2	100
11	Warren	23 ,,	2 ,,	24 Nov.	14 3 2	6 0 0	59 3	2 6 0 4	2 17 3 12	79·55	28 Oct.	8 ,,	7 ,,	1 2 23	1 19 3 6	2 3 3 25	90 52
12	Comeback ..	13 ,,	24 Oct.	18 ,,	12 0 4	5 1 18	55·1	2 1 2 1	2 18 2 26	70 67	20 ,,	31 Oct.	21 Nov.	1 1 15	1 12 1 6	2 4 0 21	73.11
13	Zealand (*check*) ..	31 ,,	11 Nov.	8 Dec.	....	7 3 2	..	2 19 2 11	2 19 2 11	100	5 Nov.	15 Nov.	9 Dec.	1 3 17	2 4 1 16	2 4 1 16	100
14	Cedar	18 ,,	26 Oct.	18 Nov.	12 2 16	5 0 5	60·1	1 18 2 23	3 1 2 7	62·86	26 Oct.	7 ,,	7 ,,	1 2 2	1 15 1 20	2 3 1 3	81·87
15	John Brown ..	24 ,,	7 Nov.	7 Dec.	16 2 5	6 2 22	59·5	2 11 1 14	3 3 2 3	80-87	3 Nov	11 ,,	7 ,,	1 2 2	1 15 1 20	2 2 0 19	84·01
16	Zealand (*check*) ..	31 ,,	11 ,,	8 ,,	....	8 2 4	..	3 5 1 27	3 5 1 27	100	5 ,,	16 ,,	9 ,,	1 3 1	2 1 0 6	2 1 0 6	100
17	Marshall's No. 3..	25 ,,	7 ,,	7 ,,	13 1 9	5 1 10	59·8	2 0 3 24	3 4 1 16	63.62	3 ,,	11 ,,	7 ,,	1 0 11	1 5 2 15	2 1 0 14	62·33
18	Rymer	25 ,,	7 ,,	7 ,,	15 0 15	6 1 14	57·8	2 8 3 18	3 3 1 6	77 20	3 ,,	10 ,,	7 ,,	1 1 19	1 13 0 16	2 1 0 22	80·45
19	Zealand (*check*) ..	31 ,,	11 ,,	8 ,,	....	8 0 12	..	3 2 0 23	3 2 0 23	100	5 ,,	16 ,,	9 ,,	1 3 2	2 1 1 2	2 1 1 2	100

From Tables I and II the following summary has been made:—

SUMMARY of Tables I and II, showing Varieties in order of Merit.

Order of Merit.	For hay.		For grain.	
	Midseason planting.	Late planting.	Midseason planting.	Late planting.
1	Zealand	Zealand	Federation	Rymer.
2	Bobs	Bobs	Marshall's No. 3	Federation.
3	John Brown	Firbank	Rymer	Marshall's No. 3.
4	Warren	Warren	Bunyip	Florence.
5	Bayah	Florence	Florence	Bayah.
6	Federation	John Brown	Bobs	Cedar.
7	Rymer	Cedar	Comeback	Bunyip.
8	Comeback	Rymer	Bayah	Bobs.
9	Florence	Federation	John Brown	Comeback.
10	Marshall's No. 3	Comeback	Firbank	Zealand.
11	Cedar	Bayah	Zealand	Firbank.
12	Firbank	Bunyip	Warren	John Brown.
13	Bunyip	Marshall's No. 3	Cedar	Warren.

This year the superiority of Zealand as a hay wheat is evident from the position it holds in the hay test; but an allowance must be made for the exceptionally wet season, which favoured the growth of the later maturing varieties and interfered with rather than helped the early varieties. Bobs secured second position in both plantings, and yielded well in the grain sections.

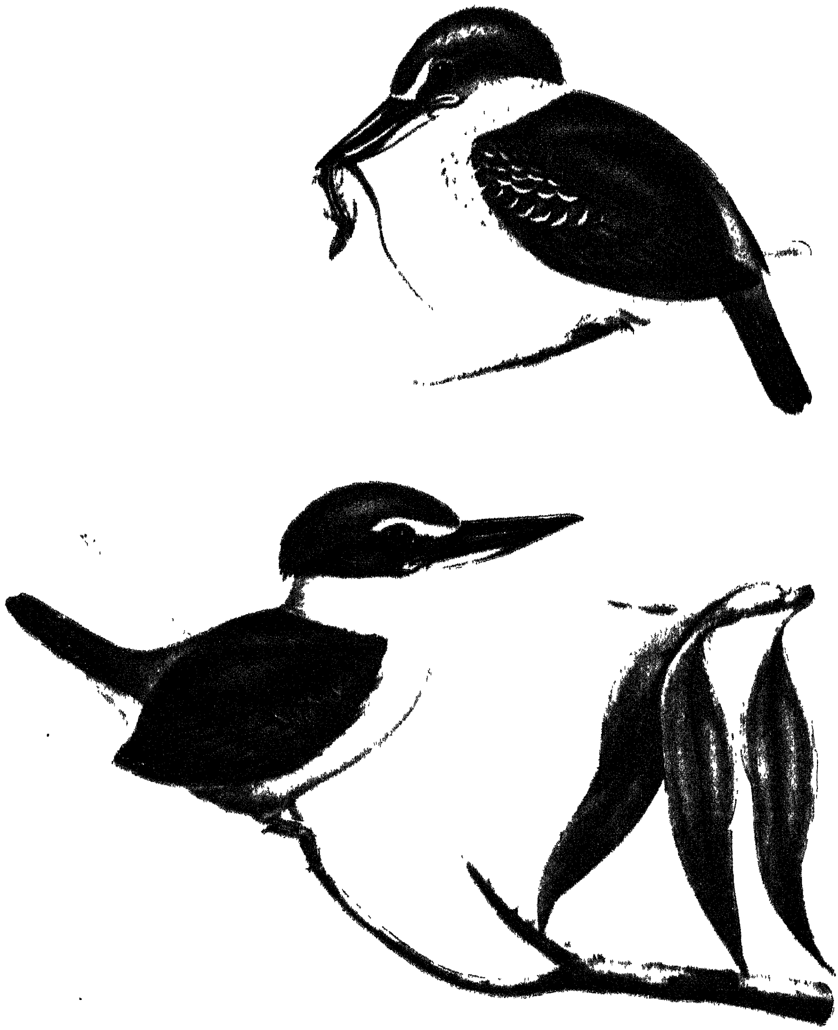
The early varieties, *Firbank*, *Florence*, *Comeback*, and *Bunyip*, suffered excessively through the continued rains after harvesting.

For grain purposes, Federation, Rymer, Marshall's No. 3, Florence, and Bunyip gave the best results.

[NOTE.—In next issue results of the seeding experiments (No. II) will be given.—ED.]

PRIZE LUCERNE HAY AND SEED.

AT the late Sydney Royal Agricultural Show, exhibits by Mr. T. G. Adamson, of Nemingha, Tamworth, won first prizes for lucerne seed and dry green lucerne hay (Items 781 and 774). Mr. Adamson presented the winning bale of hay to the Department of Agriculture. Some leading produce agents who examined the bale expressed the opinion that both the quality of the hay and the get-up were excellent. The Department is having a section of the bale cut out and sent to the Agent-General in England for exhibition purposes.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"SACRED KINGFISHER."

Insectivorous Birds of New South Wales.

[Continued from page 317.]

17. The Sacred Kingfisher.

The ancients believed that the kingfishers bred by the sea-coast, and that during their presence the sea remained calm. This was, of course, only a fable; but the actual habits of the Sacred Kingfisher in Australia are just as interesting, while they have the merit of truth.

The Kingfisher, like the men who are "opening up" this continent, is a rover. He may be born in the forest, close to the sea-shore, perhaps in the neighbourhood of Sydney, but he does not remain long in the cool coastal regions. He is a lover of the warm sun, and penetrates far into the interior of the continent. He is usually seen about rivers or creeks, or in the neighbourhood of tanks, where he is sure of a supply of water, and may, perhaps, obtain a meal of crayfish; but he can live away from water for months at a time. Wherever eucalypts can grow the Kingfisher may be found. He keeps to a meat diet, his menu, according to Mr. Hall, including lizards, small snakes, beetles, grasshoppers and the like.

In warm districts, or in unusually warm winters in cooler ones, a few of the birds may be found all the year round, but, as a rule, they migrate to the north as the winter comes on. Their range includes New Guinea, the New Hebrides, Java, and the other great islands to the north of Australia.

To form their nests, the Sacred Kingfishers bore a tunnel into a white ants' nest, or select a hole in a decaying notch of a dead gum-tree, or even burrow into a creek bank. Both male and female assist in the work. Four to six eggs are laid, oval in form, and pure white in colour.

Here, then, we have a roving pioneer, going wherever man can profitably go, accompanying the plough on its westward march. Wherever man conserves water, "the great need of the west," he is inviting these little blue-green travellers to make their permanent home, or at least to return every year in the warm weather. The greatest insect enemy to cultivation out there is the grasshopper, of which our long-billed little friend is particularly fond.

The Sacred Kingfisher is pugnacious, and will attack any intruder approaching the nest, uttering loud angry cries like "cree-cree-cree." The birds will fight desperately to protect their eggs or young from iguanas, who are disposed to seek as a resting-place the hole in the white ants' nest which the birds have made.

There does not seem much danger of the Kingfisher becoming extinct; he has the hardy, fighting temperament which tends to preserve a race or species.

But these notes are published in the hope that he may be seen in his true character of a friend to settlement and progress, and may be welcomed around the creeks and tanks of the interior of the State.

18. The Crested Bell-bird.

There are two so-called "Bell-birds" in New South Wales. The one found in the coastal ranges and forest land of the south, which was the friend of the poet Kendall, is similar in habits to the Soldier-bird, or Minah, and, like that noisy member of the feathered tribe, it is a honey eater, feeding upon the nectar and pollen of flowers as well as upon insects. In spite of its beautiful tones, "like silver bells from a distant shrine," it cannot be included in the list of purely insectivorous birds, which are the most economically valuable. The Minah, or Garrulous Honey-eater, is one of the worst pests of the orchardist and vigneron, being particularly fond of fruit. The Bell-bird of Kendall does not visit orchards, but if it were sufficiently numerous, it might easily develop into a similar pest.

No such doubt can be cast upon the fair name of the other Bell-bird, the crested species of the western districts, of which we give an illustration. This is an insect-eater, pure and simple, and in habit resembles the Grey Shrike Thrush. It is 9 inches in length, and hops about amongst the timber in search of insects, flying into the nearest tree when disturbed.

This is another valuable inland Australian bird, which is steadily helping to extend the bread-line westward by keeping down insect pests. Not only do the birds feed upon insects, but they choose the dead bodies of caterpillars with which to line their nests. Apart from its feeding habits, this Bell-bird is one of the most interesting birds of the State, on account of its peculiar power of ventriloquism. Its song is a succession of bell-like notes, rising and falling, so that it is impossible to judge the distance of the bird from the listener, or even the direction of the sound. It may be sitting motionless on a limb of a tree within a few feet, and yet its tones may appear to come from 50 yards in front or behind.

Doubtless this strange faculty assists in protecting the Bell-bird from its enemies; but still it is not very numerous, and sometimes disappears as settlement advances. On the other hand, it is as plentiful around Wellington and Dubbo, which are long-settled districts, as in the far north-west.

The nest is built in the hollow top of a stump, or in the fork between the trunk of a ringbarked tree and a sucker shooting from below, and is usually close to the ground. It is built of twigs, untidy-looking, with long straggling twigs all around it. Two or three eggs may be found in it in October or November. They are white or bluish-white, with black dots, and should be left in the nests, so that these useful little ventriloquists may not be driven from the district. They will remain in the same locality summer and winter if not disturbed.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"BELL-BIRD."

RHODES GRASS *v.* PASPALUM.

IN connection with this matter, an inquiry has been received by the Department from the Tweed River, as to whether Rhodes Grass would be available for feed when Paspalum fails—that is from June to October.

Rhodes Grass cannot be regarded as a winter grass. One of its most valuable qualities is its drought-resistance and ability to thrive in hot weather. If it ever does replace Paspalum on the North Coast it will be because it is a better summer grass. What is surprising about the matter is that Rhodes, which is a dry-country grass, should be regarded as preferable to Paspalum for the warm, moist summers on the North Coast.

The best grasses for producing a supply of fodder in winter are *Phalaris commutata*, Prairie, Texas Blue, and *Festuca elatior*. A mixture of these, sown with white clover, should yield a good supply of feed right through the winter; but the trouble is that all of these grasses are liable to be eaten out by Paspalum in the summer, and the wholesale planting of Rhodes Grass would leave us no better off in that respect, as Rhodes chokes out even Nut Grass. For the present, at any rate, farmers would do well to grow special crops for winter feed, as recommended by Messrs. Alexander and Marks in recent *Gazettes*.

The present discussion, to which dairy-farmers are invited to contribute, is as to which of the two grasses—Rhodes or Paspalum—is the better as a main summer grass for the North Coast or other districts.

Mr. H. Calderwood, of Galston-road, Hornsby, has found Rhodes Grass to grow well on a high ridge and on unbroken, poor soil, but fears it will take possession of his garden.

The photograph given of Mr. A. Jarvis' paddock of Rhodes Grass, on the Tweed River, has been supplied by Mr. R. Brooks, Dungay, Murwillumbah, who states that a bit of the same burn, sown with Paspalum, is nothing but ink-weed, whilst the seed reaped from the Rhodes has more than paid for the falling, in addition to which a splendid paddock of grass has been obtained.

Rhodes Grass, three months' growth, Mr. A. Jarvis' farm, Nobby's Creek, Tweed River.

Cleanliness in Connection with Milking Machines.

M. A. O'CALLAGHAN, Dairy Expert

MY attention has been drawn to the necessity for greater cleanliness than is generally exercised at the present time in connection with milking by machinery. The Dairy Instructors of this branch, who travel all over the country, are absolutely emphatic on this point. Week after week their reports contain lists of cream suppliers who send inferior cream to butter factories, and who are doing their milking by machinery. On the other hand, some of those who are using milking machines are sending high-class cream to the factories, so that it is evident cleanliness is the main deficiency.

The dairy-farmers should bear in mind that if they once allow the rubber tubes of the machines to become contaminated they will never be able to thoroughly clean them again. For this reason care should be taken to see that the machines are thoroughly cleaned every day; and though it may not be possible to give the time to thoroughly clean the machines after the evening's milking, they should be cleansed to a certain extent, and a thorough cleaning given next day.

Between milkings the milking-tubes of the machines should always be kept either in a strong brine consisting of a 6 per cent. solution of salt and water, or in lime-water. The Americans favour the first-named solution, and they also point out that it is necessary to see that the tubes are filled with water when inserted; otherwise the air may remain in the tubes, and the work done by the solution will not be effective.

Latterly a good deal has been heard of cows suffering from bad udders after the use of the milking machines; and whereas this may be due to a mechanical defect in the machine, still it is quite probable that much of the trouble is due to uncleanliness, because if the teat-cups are not thoroughly cleansed after each milking they will become breeding grounds for microbes, which may gain access to the teats at the next milking, and thus set up inflammation of the udder. Cows with long teats would be specially susceptible to a danger of this kind.

Unless the farmers realise their duty to the machines in the way of cleanliness, they will cause stringent measures to be taken to compel a condition of things which their own common-sense should tell them is absolutely necessary, if they are to succeed in turning out a cream which will be suitable for the manufacture of high-class butter for human consumption.

The article on how to improve cream from milking machines, by Mr. Pedersen, is specially deserving of attention at this juncture; but if thorough cleanliness is observed, pasteurisation would clearly be unnecessary, though, when well done, it would undoubtedly be an advantage.

HOW TO CHEAPLY IMPROVE CREAM FROM MILKING MACHINES.

C. PEDERSEN, Dairy Branch.

THERE should not be any great difference in quality between cream separated from milk drawn by machine and that drawn by hand; still, in the course of our routine work amongst the creams on the cream platforms of our butter factories we do find a great difference.

Speaking generally of the cream from milking machines, the quality is not so high as is desired, nor is the keeping quality equal to that of the best cream from hand-drawn milk. Perhaps much of the fault is due to the fact that a number of farmers are new to the dairying industry, and not acquainted with cleanliness to such an extent as is required in connection with the machine. For example, in one district which I visited recently, where there were quite a number of milking machines, several of these machines only received a good all-round cleaning twice a week. No experienced dairyman would expect the best result from a cream under such a system; so the fault in cream from the machines cannot be put down to the machines, but rather to those who run them.

The labour trouble in connection with milking is one of the greatest difficulties of large dairymen, and the machines will no doubt be installed at a greater rate in the future than in the past; and as the industry grows the labour difficulties are not likely to become less, but rather more troublesome.

To overcome the faults in the cream from the machines, a trial was made recently, in a district on the Northern railway line, to pasteurise the cream in a very cheap way in the dairy where it was separated. The method adopted was as follows:—

A cylindrical cream-cooler was placed under the cream spout of the separator, which was a 300-gallon Alpha Turbine, erected on 6 inches of concrete, so high as to enable a cream can to stand under the cooler. Hot water at a temperature of 180 degrees Fahr. was run through the cooler just before the cream commenced to run over it, and the cream heated to nearly 180 degrees and run into the cream can. It was then sunk into an underground tank and allowed to cool. There was no overhead water supply in this dairy. If there had been, the water would have been laid on to the cooler, and the cream would have been run over it and cooled down immediately, which would have been still better. However, as it was, the improvement was surprising, and enabled all the cream to be graded as first class.

Previous to pasteurising the cream, very little of the cream from this dairy was first grade on arrival at the factory, and a calculation of the benefit derived from pasteurising and cooling made after this system was adopted showed that the whole cost in connection therewith was paid for in two weeks by getting top price for all the cream.

The hot water, after having passed through the cooler, was run through a hose into a tub placed near the cooler, and was used for washing up, so that there was no waste of water nor of heat. The amount of hot water required to pasteurise such cream is a little less than double the amount of cream separated. Almost any vessel will do for heating the water in, but it should stand so high as to allow the water to gravitate through the cooler. Cold water should also be laid on, so that it can be run through the cooler after the cream has been heated.

The can into which the cream is run after being heated should have a small tap to deliver the cream on to the cooler. This can may be hung over the cooler, or a stand made to set it on while the cooling is done, and from the cooler the cream may be run into the can in which it will be sent to the factory. It should, however, be kept cool; but if there is no better means of keeping it cool, placing a wet bag around the can and keeping it in a draught will retain it in good order.

It is well for those who have milking machines to know how they can best arrange the heating and cooling. Those who have steam have little trouble in arranging it, and those who intend installing milking machines should consider the question of putting in steam; for unless this class of cream is pasteurised and cooled in the dairy, there will, I fear, always be more or less complaints against it.

NOTE BY THE DAIRY EXPERT.

OF late there has been a great deal of discussion on the use of milking machines, and there is no doubt but that, owing to the great development of dairying and to the scarcity of suitable labour, the machines will be introduced gradually if found to give anything like complete satisfaction. No matter how well the milking machine may do its work, unless the cream obtainable from the milk is satisfactory the general outcome will be unsatisfactory.

Mr. Pedersen, in the article given herewith, draws attention to one of the greatest weaknesses in connection with machines at the present time, and there is no doubt but that his suggestion is well worthy of a trial. The farmer who pasteurises his cream in the simple way indicated by Mr. Pedersen should arrange with the local factory manager to supply him with a "starter" to add to the cream, so that it may be ripened properly. The ingenious method of using one utensil with which to heat and cool the cream is undoubtedly capable of being put into operation on a great many dairy farms.—M. A. O'CALLAGHAN.

The Water Hyacinth.

Eichhornia (Pontederia) crassipes.

GEORGE MARKS, Inspector of Agriculture.

REFERENCE has been made from time to time in the *Agricultural Gazette* to the existence of water hyacinth in some of the rivers on the North Coast, and its danger as a probable pest. To those who know the hyacinth as the beautiful flowering plant, grown in water in glass bowls, it scarcely seems possible that it should develop into a pest. On the Clarence and Richmond Rivers, the hyacinth has already taken complete possession of numerous creeks, lagoons, and watercourses, and is spreading every year at an alarming rate. At the present time there are hundreds of acres covered with this pest.

Like many other pests, the hyacinth was introduced and planted in the district. Twelve years ago a couple of small, wilted, insignificant-looking plants were procured from a home in one of the suburbs of Sydney, and placed in Swan Creek, situated 4 miles below South Grafton, on the Clarence River. They were introduced innocently, with the object of beautifying the creek. The hyacinth, once liberated, thrived so well that in two years it took complete possession of the creek, which in this particular locality is about 50 yards wide, and varies in depth from 10 to 35 feet.

During the flowering season the creek was a pretty sight, and lovers of flowers visited the locality from all parts of the district. Each, in departing, carried a small plant or two to place in watercourses near his or her own home, so it was not very long before the hyacinth was innocently introduced to all parts of the district. Every flood or strong fresh in the Clarence or Richmond brings down acres and acres of hyacinth, which become a danger to navigation. During January of this year the hyacinth was responsible for suspending ferry traffic at Grafton, and on the Lower Clarence several punt-wires were broken. In many of the "clumps" of hyacinth, which reached a quarter of an acre in extent, logs were to be found, and some idea of their danger may be estimated when it is remembered that these were being carried down with the current at the rate of from 4 to 6 knots an hour.

Efforts have been made on several occasions to get rid of the pest, and at Swan Creek alone a sum of something like £800 was expended by the late Sir John See in taking the hyacinth out. This work was never completed, however, with the result that in a few years the whole of the creek was again covered.

The hyacinth is not confined to this State alone. In Florida the pest has assumed gigantic proportions, and it may not be out of place to republish a reprint that appeared in the *Agricultural Gazette*, Vol. VIII, Part 10, page 698.

Introduction and Spread of the Water Hyacinth in Florida.

As nearly as can be learned, however, it was first introduced into the St. John's River about 1890, at Edgewater, about 4 miles above Palatka. At this place it had been grown for some time in a pond, and when it was decided to clear the place out, the plants were thrown into the river. Here they grew luxuriantly, producing beautiful masses of flowers, which rendered the river attractive. At this time no one had any idea the plant would become a nuisance, and it was carried by settlers up and down and introduced at different points to beautify the river in front of settlements. It was also distributed by boat as far as the increasing brackishness of the water allowed its growth. In 1894 the water hyacinth had become so abundant that it began to attract the attention of steamboat men and fishermen, although at that time the amount was not sufficient to cause trouble. After the severe storms of October, 1894, which carried the plants out of the bayous and creeks, they were noticed to be very abundant.

In October, 1894, some plants were carried up the Ocklawaha River, the main tributary of the St. John's, and placed in a pool at Howard's Landing, 14 miles down the river from Silver Springs. This became the seed-bed for the entire lower and navigable portions of the Ocklawaha River. The plants multiplied rapidly, and were crowded out into the river. The current carried them downstream, and they have spread along the entire lower portion of the river.

Damage caused by the Water Hyacinth.

That the water hyacinth is becoming a serious menace to navigation in the St. John's River is unquestionably true. Small boats with screw propellers find it impossible to penetrate a very large mass of the plants, as they lack the necessary power, and the plants soon become entangled in the screw, and prevent it from revolving. Parting the plant with boat-hooks, &c., is very slow and tedious. Paddle-wheel steamers are able to penetrate the extensive masses of the plants much better, but are generally hindered and frequently entirely blocked. When a large steamer, going at full speed, strikes a bank of the hyacinth, it comes almost to a standstill. In sidewheel steamers the plants collect between the wheel and bulkheads, packing it so solidly that it is often almost impossible to reverse the engine. This necessitates caution in approaching the landings. Steamers with low-pressure engines are troubled by the clogging of the injector pipes, so that sufficient water cannot be secured for the condensers. In the case of some boats the obstruction is occasionally removed by blowing steam through the injector-pipe. This process, however, is rather dangerous, as the injector-pipes and condensers are not constructed with a view to having heavy pressure applied from within. Floating logs frequently lie concealed in the masses of the plants and form a serious danger to navigation. Several boats have already been injured to some extent by striking such obstructions.

How the Weed is spread.

At the present time the hyacinth is growing luxuriantly on the Clarence and Richmond Rivers and their tributaries. There are smaller quantities on the Tweed and Macleay Rivers, while it may be found growing in bowls of water in the home gardens on all of the rivers on the North Coast. Notwithstanding the fact that there are numerous residents who know what a curse the weed is, unfortunately there are those still who are innocently spreading the pest.

As an example: Last January, when there were scores of acres of hyacinth floating down the Clarence, a Queensland lady, who was travelling in the river steamer from Copmanhurst to Grafton, was so charmed with the beauty of the delicate pale mauve or lilac-coloured blooms that she insisted upon procuring a few choice plants, which were forwarded by her to her home in Queensland. This is only one of many cases that might be quoted.

The hyacinth is a pretty aquatic, and thrives in water in a hot climate. The foliage is killed by frosts in the winter. It seeds profusely, and it is mainly on this account that the plant is difficult to eradicate. At the base of the leaf stalk is a large bulbous-looking development, which is composed of numerous air-cells, which act as floats and support the plant in the water.

View from a bend in Swan Creek, Clarence River, showing the plants in full bloom.
This was formerly a rowing track for amateur scullers.

Water Hyacinth in Swan Creek, showing young oak-trees growing in the weed over 10 to 25 feet of water.
There is a depth of from 2 to 3 feet of roots and decomposing matter.

Water Hyacinth at Swan Creek, Clarence River.

The roots form an entangled mass, and penetrate a depth of 4 feet. Note the oak-trees 2 to 6 feet high, growing in the hyacinth. Where they are growing there is 20 feet of water. When they reach 6 feet in height the wind cause them to lean, and gradually they fall over.

Water Hyacinth taking possession of drains at Ulmurra Swamp, Clarence River.

The roots penetrate to a depth of from 2 to 4 feet, and it thrives just as well in 40 feet of water as in that only a few feet deep.

The seed as it ripens falls between the leaves of the parent plant, and coming in contact with the water germinates and grows. As the older plants mature they are gradually forced below the surface of the water by the younger generation, and as they die they accumulate at the bottom. In shallow watercourses or lagoons it is only a matter of a few years when they will be filled up with a dense mass of decomposing organic matter.

As regards navigation, the weed has already caused some degree of inconvenience, and in some of the smaller arms, where the drogher collects the farmers' produce for the ocean-going steamers, the hyacinth is causing many obstructions.

Necessity for Action.

In travelling through the district one is rather surprised at the utter indifference shown by many farmers, and one cannot quite understand why no effort is made to take out a few stray plants that have made their appearance in the creeks or lagoons that perhaps provide their only supply of water for stock. This would not take more than a few minutes, or an hour or two at most, and numerous instances might be given where a few years ago a couple of hours' work would have eradicated what now would take hundreds of pounds to do. This indifference may be partly due to the fact that it is very generally recognised by the farmer that the hyacinth will only block navigation, either to boats, droghers, or ocean steamers, and that does not affect him. So one sees along the river frontages of the lower portions of the Clarence and Richmond Rivers scores of miles of detached portions of the weed, in some instances secured amongst the reeds or bushes, in other cases floating backwards and forwards by the movements of the tidal flow or of the winds.

It is claimed that the salt-water will kill it. While that is so, it must be remembered that the river is frequently fresh for a considerable period in the early autumn, and during flood-time there is ample time and opportunity to have these floating weeds conveyed to fresh-water creeks and lagoons before the river again becomes salt.

Apart from the effect on navigation, of which the St. John's River in Florida, United States of America, affords a most striking example, there is another phase of the subject not generally known, but which directly affects the farmer. On hundreds of farms on the North Coast the only supply of water for farm stock is obtained from lagoons, creeks, or blind watercourses. When the hyacinth becomes established such water is rendered unfit for drinking purposes. The decomposing plants give off most offensive smells, the water becomes inky black and putrid, and stock will not touch it. Along the banks of Alumny Creek, portion of which runs through the city of Grafton, the odours arising during the summer months are most obnoxious, and whilst no direct sickness may be attributed solely to this cause, at the same time it must be admitted that such a state of things is not conducive to health.

In drought times the only green feed available for stock in many localities consists of the hyacinth, which they eat readily. At such periods the animals are in a more or less emaciated condition, and as the weed is eaten to the water's edge along the creek banks, the animals have to reach farther to secure the necessary amount. In doing this they frequently slip in, and when once they get below the dense mass of entangled root growth they cannot get out again, and unless human aid is immediately forthcoming the animals are speedily drowned. In one portion of the Clarence district alone, last year, several landowners were kept employed daily for some weeks lassooing and pulling out beasts that had slipped into the creek; and notwithstanding these precautions some sixty or seventy head were lost.

While in such localities the landholders could not afford the time or expense of eradicating the weed, there are scores of places where on private farms a few hours' labour would enable the growing plants to be taken out, and if this work were followed up at regular intervals to remove any plants that had afterwards developed from seed that had ripened prior to the destroying of the first lot of plants, it would not be a difficult task to keep the pest down.

In the rivers or their tributaries, where there are swift-flowing currents, the hyacinth is not likely to do much damage. Though it may thrive in the still waters found in pockets along their banks, or be prevented from being carried away in the ordinary current by clumps of bushes or fallen trees, it is an easy matter to clear such channels by forcing out the weed with poles in flood time, when the waters would carry them away.

It is on the level country, where the waters are confined, as in lagoons or swamps, or the low country, as found on the lower portions of the coastal rivers, where the waters are still or move very slowly, that the hyacinth is difficult to eradicate. In some of the channels recently cut to drain swamp areas, the hyacinth is gradually forcing its growth against a somewhat sluggish current at the rate of several feet a month.

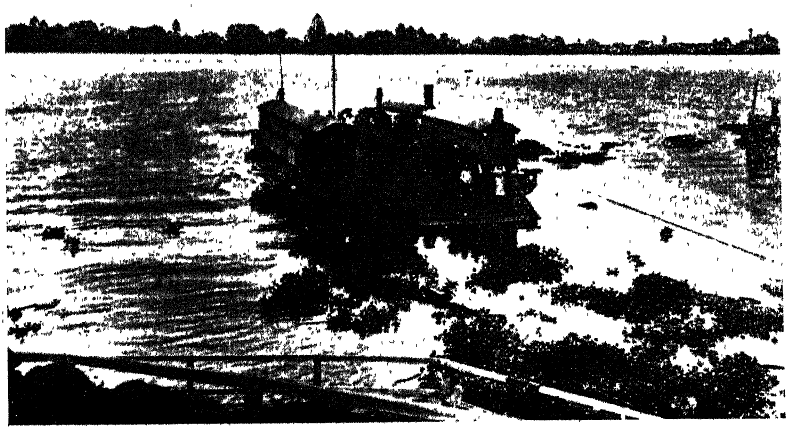
Efforts must be united and systematic.

At present, whatever action is taken by private individuals or shire councils to clear certain areas in these low-lying localities is greatly interfered with by every strong fresh or flood bringing down and depositing new supplies of this weed. The hyacinth has taken possession of a large area already, and the rapid rate at which it is still spreading demands more than passing notice. It is useless for one man to try to free his property if his neighbour does nothing, or for one shire to spend large sums of money if other shires situated on higher country make no attempt to do their share.

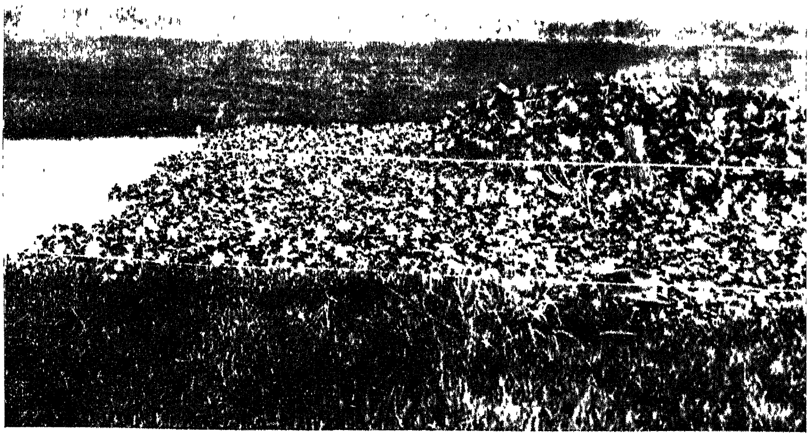
Whatever action is taken, it is essential that it be united and systematic. To remove the hyacinth from the water and have the plants destroyed is in itself not sufficient. The work must be followed up in such a manner that young plants appearing later do not get a chance to flower and seed. Unless this is done, it is like the individual endeavouring to free his farm of thistles by cutting out the plants after they have seeded, and expecting to have no further trouble.

Water Hyacinth.

A total weight of over 28 stone, supported by the hyacinth, on a board 12 inches wide and 10 feet long; over 7 feet of water. The end of the board is 2 feet from the bank. The sedges on the left are growing over 30 feet of water.



Water Hyacinth blocking the steam ferry at Grafton, Clarence River.



Water Hyacinth taking possession of a drain, Ulmarra Swamp, Clarence River.
The tall weeds are the old plants. The short weeds are the young plants, and represent two months' growth against the current of the drain waters.

Water Hyacinth floating down stream during recent fresh (January, 1911). View at South Grafton, Clarence River.

Methods of Eradication.

Various methods have been suggested for eradicating this weed. In the first place, people should be prohibited from growing the water hyacinth in the bowl attached to the home garden. The lantana is another instance of a garden shrub that has proved a curse after it got outside the bounds of cultivation. The hyacinth will not thrive on dry land, but if placed in large heaps many of the plants may remain green for many weeks on account of the large amount of moisture found in them.

The only practical method of dealing with it appears to be to drag the weed out of the water and place it on dry land in such a position that stock will not force some of it back into the water, and as fast as it dries burn it. Where the surface is large, boats or punts would be required. The hyacinth, which grows in such a compact mass, is first cut into small sections with a sharp brush-hook, and then towed to a suitable landing stage where it can be lifted out. No doubt "grabs" similar to those used for lifting sugar-cane out of punts could be easily adapted for this purpose.

Smaller pieces could be secured by using a large wooden rake with teeth on both sides. This is secured to a hand line and thrown out. Whichever way it falls there will be teeth to work and the weed can then be pulled in.

As it is practically impossible to prevent the plants from flowering and producing seed, it will be necessary to follow up the work regularly with the object of securing all the young plants that have germinated from seed before they are able to flower again.

While there are several localities where it would cost thousands of pounds to take out the weed at present growing, and which would be beyond the means of any North Coast farmer, yet there are many localities where the hyacinth has not covered such an extensive area, and where, with thorough and systematic work, followed up in the manner already indicated, it would not cost a great deal of labour, time, or money to eradicate it.

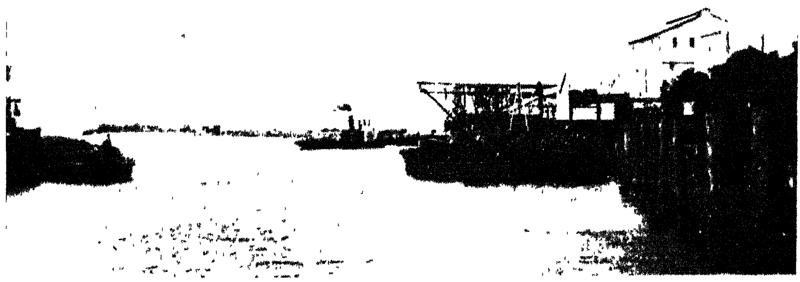
Unless some efforts are made in the direction of checking its rapid spreading through the watercourses of the hot portions of this State, the trouble will have to be faced in the near future, when it will cost a great deal more to cope with it than at present.

Farmyard Manure.

When using stable or farmyard manure on a large scale, it is found to give the best results if applied direct to the land; and farmers in districts where agriculture is advanced now treat their manure in this way.

If it is required to well rot the manure, the best plan is to put it in a shed and stack it, mixing with it any waste straw or other vegetable matter. Arrangements should also be made to save the urine.

When the manure is stacked in any quantity, heat is quickly generated, and this destroys most of the larvæ of insects and seeds of weeds; but, of course, there are some of the harder seeds which, if not exposed to considerable heat, will still grow if put on to the land.—G. Valder.



Cane Punts on the Richmond River.

Sugar-canes at Duck Creek Farm.

H. R. ALEXANDER, Manager, Wollongbar Experiment Farm.

DUCK CREEK FARM, situated at the junction of the Wardell and Alstonville roads, 4½ miles from Ballina, consists of 460 acres of low-lying flat land, and is typical of a considerable area of Richmond River country which up to the present has been but indifferently developed.

In the early days, the bulk of this flat country was swamp, but now, with clearing and drainage, some excellent farms exist upon it. With dairying as a side line to provide the wherewithal to "keep the pot boiling," but sugar-growing as the main industry, there is no reason why much of the land now almost unimproved, lying in the neighbourhood of Duck Creek, could not be made to carry a considerably increased and prosperous population.

When drained, this low river-flat land is admirably adapted to sugar-growing; and as water is accessible at almost all points, the problem of cane-transport to the sugar mills is readily and cheaply solved.

During the sugar-harvesting season, the Richmond River presents an animated scene. River steamers loaded with cream cans, making for the various butter factories, and droghers hauling to the sugar mills their long strings of heavily loaded cane-punts, would make one say that this, if not "the land flowing with milk and honey," is certainly the land of cream and sugar.

Much has already been done by the pioneers of the sugar industry in experimenting and introducing canes suitable to Richmond River conditions; and their efforts have been so widespread that perhaps I may be pardoned for giving a brief summary of the origin, development, and suitability of the various canes already known to, and at present grown by farmers on the Richmond:—

MALABAR.—A greenish-yellow sugar-cane. A local cane, originated from green-coloured sport stalks found growing amongst "Striped Tanna" canes. "Striped Tanna" sugar-cane was introduced to New South Wales from

Badila. Planted 6th and 7th October, 1910. Photographed 7th March, 1911.

Demerara 1,135. Planted 23rd September, 1910. Photographed 7th March, 1911.

SUGAR-CANES AT DUCK CREEK FARM, RICHMOND RIVER.

General View of Cane-field.

Malabar. Planted 16th and 17th September, 1910. Photographed 7th March, 1911.

SUGAR-CANES AT DUCK CREEK FARM, RICHMOND RIVER.

North Queensland some years ago, when the "Rappo" and "Mauritius Ribbon," then the leading Richmond River canes, were very subject to gumming.

"Malabar" is considerably a better cane for Richmond River conditions than the parent Striped Tanna. Its sugar-density is regular and good. It is one of the best canes at present grown on the Richmond. It is an easily trashed cane, giving best results when cut as a two-year-old crop. In isolated cases, "Malabar" has been affected by a disease known locally as "Curly Top."

MAHONA.—A purple-coloured sugar-cane; introduced from New Guinea by the New South Wales Government, and first planted at Wollongbar Farm in January, 1896. It is recognised as one of the sweetest canes grown on the Richmond, and is planted extensively in this district.

"Mahona" proves an excellent annual cane, yielding heavily in both weight of cane per acre and sugar-density of cane. It grows equally well on light and heavy soils.

MAURITIUS SEEDLING, 1900.—A purple-coloured cane; introduced in 1903, from Fairymead, near Bundaberg, Queensland, by the Colonial Sugar Refining Company.

Cane Transport from Field to Richmond River.

Cut as a two-year-old crop, "Mauritius Seedling, 1900" produces heavy yields of high quality cane. This variety is not grown largely on the Richmond River, but is considered a most promising cane, likely to develop better qualities as it becomes more adapted to local conditions. It shows a tendency to "arrow" when grown under certain exceptionally good cane-growing weather conditions.

NEW GUINEA No. 14.—A green-coloured cane; rather thin in the stalk, but an exceptionally heavy stooler.

"New Guinea No. 14" is one of a large number of varieties of cane introduced from New Guinea about 1895 by Clarence River farmers. The whole of this shipment of cane sets was taken over by the Colonial Sugar Refining Company, and grown on their Experiment Farm. Variety No. 14, showing promise, was planted in large areas on the Clarence River, its chief recommendation being that it appeared to be a hardier and better frost-resisting cane than other varieties then grown on that River. Subsequent experience proved "New Guinea No. 14" to be a difficult cane to trash and harvest. Its sugar quality also fluctuated considerably, being frequently decidedly low in density. Owing to the weaknesses mentioned, this cane has fallen into disfavour. Best cut as a two-year-old crop.

DEMERARA No. 1,135.—A bright, light purple-coloured cane; introduced by the Colonial Sugar Refining Company, from Fairymead, Queensland.

So far as growing trials of this cane have progressed, "Demerara No. 1,135" proves best as a two-year-old plant cane, but is of uncertain sweetness and somewhat difficult to trash. As a "ratoon" cropper, it is reported to develop poorly. It is an exceedingly straight grower, carries a dark olive-green leaf of attractive appearance, and has few dead stalks as a two-year-old crop.

On the Richmond River, it is questionable whether this cane is likely to prove the continued success that "Demerara No. 1,135" has been found to be in other parts of the States. Here its sugar-density appears to be greatly influenced by weather and soil conditions. In this respect it cannot be relied upon, as can the two more largely grown varieties, "Malabar" and "Mahona."

As the true character and value of "Demerara 1,135" have not as yet been fully demonstrated, this cane should be given a further and more extended trial.

NEW GUINEA No. 16.—A dark purple-coloured cane.

"New Guinea No. 16," grown on the Richmond River, is most probably a sport of "New Guinea No. 23"—a cane with the same history as "New Guinea No. 14." Under certain conditions this cane grows into heavy crops of high sugar-density, but does not do well universally in this district. Ample opportunity has been given to plant and thoroughly test this cane. Had it proved a really reliable variety, the area under "New Guinea No. 16" would now be much greater than is the case.

PETIT SENERVILLE.—A light purple-coloured cane; introduced from Fairymead, Queensland, in 1903; may have originally sprung from "Demerara 1,937."

It proves a good yearly cane; but from small trials already made, it seems liable to "arrow," for which reason it cannot be recommended for general planting till further trial has demonstrated, and perhaps developed, its qualities.

NEW GUINEA No. 23 (STRIPED).—A purple-coloured cane, with well-defined yellow stripe; history similar to "New Guinea No. 14."

A good growing cane of average density. Like "New Guinea No. 16," it only yields good crops in certain places, and under favourable conditions.

NEW GUINEA No. 23 (GREEN).—A green-coloured cane, grown from green sport stalks found amongst "New Guinea No. 23 (Striped)".

It has the same relationship to "New Guinea No. 23," as "Malabar" has to "Striped Tanna"; and, from the small experience yet gained, bids fair to be as superior to "New Guinea No. 23 (Striped)," as "Malabar" is to "Striped Tanna."

BADILA.—A dark-purple cane; originally known as "Moana"; introduced by New South Wales Department of Agriculture, and first grown at Wollongbar in 1896.

"Badila," very popular in North Queensland, is a short, thick-growing cane, carrying heavy foliage. It yields a good weight of cane per acre, and the density is also fairly regular and good. It cuts best as a two-year-old crop. This cane also bears the reputation of being a good frost-resister. It is deserving of more attention in this District.

"H.Q. 426," "63," "51," "297," "68," "50," "114," and "Demerara No. 115," are canes recently introduced to this District from Hambledon, Queensland, by the Colonial Sugar Refining Company, for trial purposes.

The Experiments at Duck Creek.

The following table shows the cane-sets planted at Duck Creek Farm, the condition of the sets when planted, and the date of planting in each case:—

Variety.	Condition of Sets when planted.	Date of Planting.
Malabar	Sets cut from one-year-old cane; buds in good condition.	16, 17, and 20 Sept., 1910.
Mahona	do do	do
Mauritius Seedling, 1900.	do do	15 and 16 Sept., 1910.
New Guinea No. 14	do do	do
Demerara, 1,135 ...	do do	23 Sept., 1910.
New Guinea No. 16	Sets cut from two-year-old trashed cane; buds slightly damaged.	5 Oct., 1910.
Petit Senerville ...	Sets cut from one-year-old cane; buds in good condition.	4 Oct., 1910.
New Guinea No. 23 (Striped).	Cut from two-year-old trashed cane; buds considerably damaged.	5 Oct., 1910.
Badila	Sets cut from two-year-old cane; buds slightly damaged.	6 Oct., 1910.
New Guinea No. 23 (Green).	Cut from two-year-old cane; in very bad order ...	6 Oct., 1910.
H.Q. 426	Sets looked dry on arrival; were soaked in water for 12 hours before planting.	6 Oct., 1910.
H.Q. 63, 51, 297, 68, 50, 114, and 115	Sets received from C.S.R. Co.'s experiment plots on Mr. Kempnich's farm.	6 Oct., 1910.

Progress Report.

On 1st March, 1911, all varieties were growing well; the earlier planted canes particularly so. Owing to bad drainage, the growth on fully 1 acre of the plot is stunted.

A further 10 acres of land at Duck Creek has been grubbed and ploughed, and at present carries a crop of maize. This land should be in excellent order for cane-planting during the spring of 1911, provided the drainage scheme under consideration is approved and completed.

While it is admitted that several sugar-canes now grown on the Richmond are admirably suited to New South Wales conditions, past experience in local cane-growing gives no guarantee that such canes will retain their good qualities indefinitely. New canes must be regularly introduced, and as new canes take several years to become acclimatised and developed under Richmond River conditions, the need of a permanent station where such work can be systematically carried out is apparent.

When drained, some excellent cane-growing land will be made available at Duck Creek Farm, and the property having a deep-water frontage, cane for the sugar mills or cane-sets to farmers situated on any part of the river can be conveniently transported.

Traying Seed Potatoes.

At the Cheltenham Experiment Farm, Victoria, Mr. G. Seymour, Potato Expert, has made some tests of the Scottish method of sprouting seed potatoes in trays before planting. In 1908, an increased yield of 4 tons per acre was obtained as against unsprouted seed. In 1909–10 the increase was over 2 tons per acre.

The advantages claimed for the method which contribute to increased yields are that the potatoes can be planted eight weeks later, thus enabling early crops to escape frost, come overground quickly, and, being vigorous, be better able to resist disease. The method also enables "thready-eyed" seed to be detected and thrown out. Against these advantages, of course, must be placed the cost and the labour. The seed potatoes are placed in trays, made from fruit or kerosene cases, as soon as dug. The trays are stacked on top of one another in a shed until the buds begin to move, when they are placed on racks provided. The expense and labour will probably prevent the method from being adopted on a large scale, though Mr. Seymour states that some Scottish growers have treated upwards of 100 tons in one season.

Plans and specifications for trays and shed are given in the Journal of the Victorian Department of Agriculture for March, 1911. A copy may be obtained from the Secretary for Agriculture, Melbourne, price 3d.

Experience with the Irish Blight.

New Seed and New Ground Advocated.

S. R. MUSGRAVE.*

"That the spent earth may gather heart again,
And, better'd by cessation, bear the grain."—DRYDEN.

PERHAPS the history of no country in the world is so interwoven with the growth of the potato as Ireland, for from the time the tuber was introduced into that country in A.D. 1610 by Sir Walter Raleigh until the present day, the potato has formed the staple food of a large section of the community. In the year 1845 Ireland contained a population of over eight millions, the majority of whom subsisted on potatoes. It is not to be wondered that when the potato crop failed in 1847 and the great famine resulted, when the death-rate for the year was as high as 300,000, the major portion of the mortality could be laid at the door of the Irish blight which had devastated the potato crop. Whilst the famine was at its height the Government issued rations for about 3,000,000 persons weekly.

Although the potato does not form the staple article of diet in Australia, it is practically part of the daily food, and its disappearance from the dinner table, for even a time, would be a matter for regret by many.

There is no denying the fact that the Irish blight—which was responsible for the great famine referred to—has obtained a firm hold in all the potato-producing districts in this State, and neighbouring States are pretty well in a similar position. Those engaged in the industry in New South Wales do not seem to take a sufficiently serious view of the situation, and the general tendency appears to be to try to conceal its existence. If we are to be guided by past history, this is not at all a wise attitude, and growers must face the situation with a stern determination to grapple with the blight and beat it, for if we are careless of consequences in this matter it will be a case of good-bye to profits from the potato crop for years to come. This is the experience gained in Ireland in my young days, and it has been suggested that my experience might be of service to those engaged in the potato industry in this country—hence the writing of this article.

In New South Wales to-day much is being done by the Department of Agriculture with a view to educating growers in the best methods of combating the blight; and I remember that thirty years or so ago two of the

* While the Department is not prepared to say that the carrying out of Mr. Musgrave's recommendations will make the blight "a thing of the past," they are, certainly, good farm practice, and nothing but good can result from their adoption.—ED.

methods now suggested were tried in Ireland with success. I refer to the introduction of new seed, and fallowing for at least two years the ground which had been cropped with potatoes; and I am convinced that the solution of the blight question in this country lies in the adoption of these methods, combined with the more modern methods of treating the seed before planting and spraying after planting.

In Ireland at the time to which I refer, the seed introduced immediately after the famine was commencing to show signs of running out (as the Brownell's are with us just now), and the fears of another famine existed. The agricultural journals of the day, however, began a crusade in favour of the introduction of new seed from a totally uncontaminated source. The more advanced growers adopted the suggestion, and procured new seed, principally from Scotland, where the potatoes at the time were free from any indications of the blight. The introduction of this new seed, however, taught another and very important lesson; for it was found that what was planted in new ground proved free from blight, whilst the disease was noticeable to an extent in places where the new seed was planted in ground previously cropped with potatoes in which the blight had existed.

About the year 1880, a determined effort was made, practically throughout Ireland, to place the potato industry on a sound footing; and a species of potato called the "Champion," was imported from Scotland, and planted in nearly every case in new ground. The result was remarkable. Not only were large sound tubers produced, but no blight made its appearance.

The ground previously used for potatoes was allowed to lie fallow, and it was found that at the expiration of from two to three years there was no tendency towards a recurrence of the blight in that particular ground. The necessity for a rotation in crops became so impressed on the minds of the governing authorities, that agricultural subjects were taught in the national schools, and I remember that the three and four years' rotation of crops was drilled into the scholars, often at the point of the cane. The three years' rotation was:—

1st year, root crops manured;
2nd year, grain laid down with grass;
3rd year, grass.

This was done with a view to impressing upon the prospective farmers the idea that failure could only result from the successive cropping of one particular variety in the same soil, as was often done at that time, and which is still done in places in our progressive State of New South Wales to-day.

"New seed and new ground" became the maxim of the up-to-date farmer in Ireland then as a preventive for the blight.

The success of the "Champions" on the occasion referred to, formed the subject of much talk, and their fame was carried across to America by the Irish emigrants, and there formed the theme of popular music-hall ballads, one of which contained the refrain:—

"We'll all go home to Ireland,
When the Champions grow."

The question to be faced here is :—Where is the new seed to be obtained from? The neighbouring States have blight to a greater or less degree. Queensland has been drawing her potato seed from New England for some years, and blight exists in that State. I will leave the solution of that problem to the officials of the Agricultural Department, but would point out that experience has demonstrated that the seed must be from a practically untainted source, and the procuring of new seed will be so much useless work unless there is a combined move on the part of the growers to plant seed in new ground. By the adoption of these precautions, together with the more modern adjuncts referred to already, there is no reason why the much dreaded Irish blight should not be a thing of the past so far as the industry is concerned in this State.

Potatoes in Gunnedah District.

A Correspondent asks whether he would do right to plant potatoes on new ground, about 35 miles from Gunnedah, on the outside edge of Pilliga Scrub; rainfall, 28 to 30 inches; soil, black and loamy, more than 4 feet deep, over clay.

The Chief Inspector of Agriculture reports that potatoes should do fairly well in the district mentioned, especially on such a deep soil, but very thorough cultivation will have to be given in order to get satisfactory results. Potatoes would do best if grown after a crop of peas—that is, put in peas as a winter crop, and follow with potatoes as a summer crop.

Bananas and Plantains for the North Coast.

"W.G.M." asks the best kinds of bananas to plant, say, between Coff's Harbour and the Clarence; also, whether plantains are grown in New South Wales, and with what results.

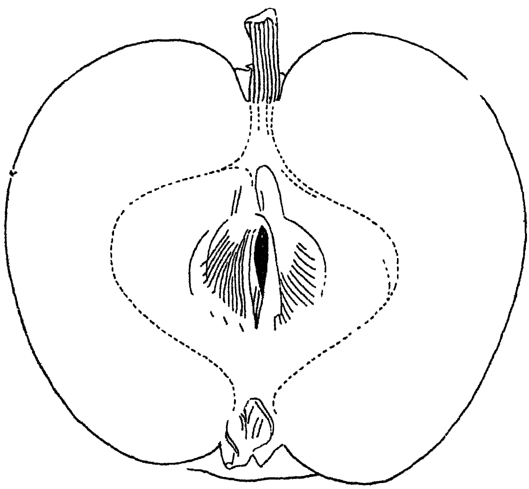
The manager of Wollongbar Experiment Farm reports that on the Northern Rivers several varieties of bananas are grown, Cavendish, Lady's Finger, Fiji, and Plantain being the ones most generally in favour. On the Tweed River the Cavendish banana is preferred. On the Richmond, Cavendish and Lady's Finger are the most largely grown in sheltered spots; Plantain being grown in more exposed positions. On the lower rivers the Plantain will be found to do best for cultivation under exposure to a wider range of temperatures than is experienced on the Richmond and Tweed Rivers. The Plantain fruits well as far south as the Manning, but is a rather coarse, poorly flavoured banana.

All banana plantations should be situated in places sheltered from winds, and as free from frosts as possible.

The Carrington Apple.

W. J. ALLEN.

THE attached coloured plate shows two apples—Carrington (streaked) and Carrington Red. The specimens were forwarded by Mr. A. L. Smith, of North Rocks, and were taken from trees which are 11 years old.



Carrington (streaked).

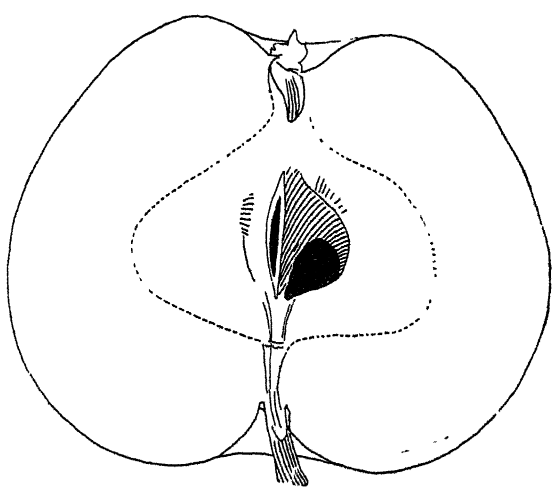
The red apple commands a higher price, and is therefore of greater commercial value than the streaked variety.

The Carrington is a first-class apple for coastal districts, and thrives well on sandy loam soils. It is very early, which adds greatly to its value. On the high lands it would come in too late to compete against fruit of the same variety grown on the coast.

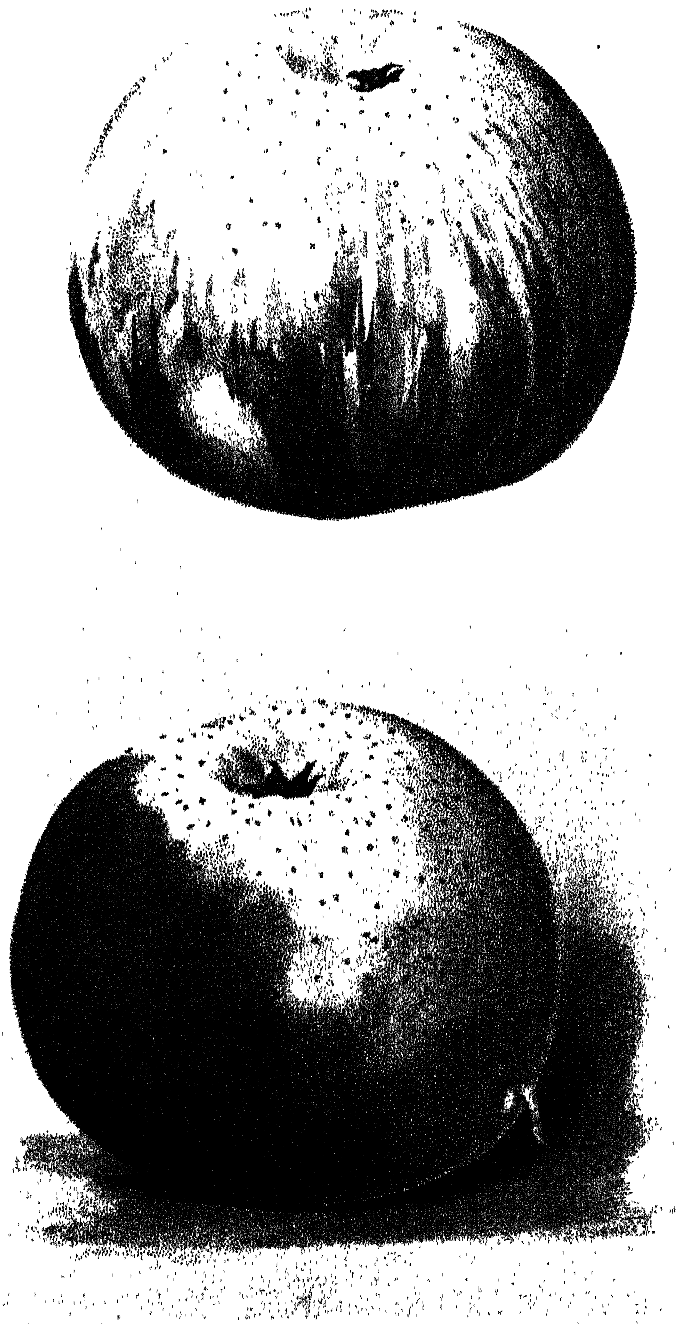
It is a tip-bearer, and requires long pruning.

Size.—Medium and roundish.
Colour.—Clear light-red in the sun.
Flesh.—White, very tender.
Skin.—Pale yellow
Season.—December to middle of February.

The Carrington is a prolific bearer, but the fruit does not keep well. It has the reputation of being thoroughly proof against American Blight (woolly aphis) and is our best early dessert apple.



Carrington Red.



Pea-growing on the Kurrajong

P. G. GILDER, English Master, Hawkesbury Agricultural College.

MANY of our readers are aware of the attention paid to that p pular vegetable, the pea, on the picturesque slopes of the Kurrajong. An examination of available New South Wales agricultural literature has shown that, so far, very few details of its culture on a commercial basis have been published. In most cases it is treated as a purely garden product, and the advice usually given runs somewhat as follows :—"Take the opportunity to sow largely of this general favourite in rows about 3 feet apart." The "largely" in this instance refers to a few rows only ; but inasmuch as the crop is grown by no means infrequently in areas of 20 acres at a time, it may be said to be deserving of somewhat more consideration than it has already received.

Fruit-growers on the Kurrajong have made a speciality of its culture, and in some seasons remarkably good cheques have been received. For growing on newly-cleared land intended for citrus trees, in which every attention given to the preparatory crop serves the dual purpose of increasing the yield of that crop, and of greatly improving the prospects of the orchard itself, it has been found to be invaluable, while even when the trees have been planted, several rows of peas can be grown between the lines of trees, until the latter commence to bear. In many cases, with favourable seasonal conditions, the interplanted crop has paid the whole cost of orchard upkeep till the trees paid for themselves, and thus that great bugbear of intending fruit-growers, the interval of time and outlay of cash between the initial clearing and the bearing stage, has been overcome. What this means to the struggling settler, no one who has not himself undergone the experience can ever imagine. The humble but useful pea may, therefore, be looked upon as no inconsiderable factor in the establishment of some of the orchards whose returns afford a comfortable competency to their owners.

In collaboration with Mr. W. S. Arnold, of Samarai, Kurrajong, a cont mporary diploma student of the writer, the following data have been prepared. The returns are those actually received from the agents, after the deductions have been made for freight, commission, &c. The actual cost of pulling has been given, in order to demonstrate the importance of the question of available labour.

The area sown comprised a newly-cleared block of some 22 acres belonging to a gentleman residing in the locality, and Mr. Arnold agreed on mutually advantageous terms to cultivate the ground for two years before the trees were planted. The total cost to the owner, including land, survey fees, fencing and clearing, was £250. The soil is a fairly good chocolate loam, varying from 5 inches to as much as 2 feet deep (2 acres of the latter class were exceptionally good, and yielded no fewer than 440 bushels). The aspect is north-easterly, and the location high enough to make it comparatively free

from frost, a vitally important item in pea culture. During the winter the frost line is most clearly marked in the hollows, and therefore it may be stated that good air drainage as well as water drainage is imperative.

The ground was taken in hand just as the clearers left it, and the first ploughing cost about 25s. per acre. Two harrowings were then necessary to clear away the small roots, bush rakings, &c., at a cost of 2s. 6d. each. This was followed by a second ploughing, two harrowings, and one rolling. Drills were opened out 3 feet apart, and the seed and manure sown with a corn dropper, the plate of which had been especially adjusted for the purpose. Dropping in this way is a somewhat slow process as compared with that for corn, as the boxes have to be filled so often, but it is infinitely preferable to carrying out the same operation by hand. A couple of scufflings, in which every care had to be taken to prevent injury to the vines, completed the cultivation. The seed was sown at the rate of 1 bushel per acre, and its cost ranged from 15s. to 20s. per bushel, the total for the 20 acres being £16. A manure suitable for legumes was used at the rate of 4 cwt. per acre, at 6s. per cwt.

The cost per acre up to this stage may be summarised as follows:—

	£	s.	d.
First ploughing	1	5	0
Two harrowings, at 2s. 6d each	0	5	0
Second ploughing	0	10	0
Two harrowings, at 1s. 3d. each	0	2	6
Rolling	0	1	3
Drilling	0	3	4
Dropping	0	2	6
Two scufflings, at 2s. 3d. each	0	4	6
Seed	0	16	0
Manure	1	4	0
	£4	14	1

It will be noted that some of these costs appear rather high, and the two first-named items may certainly be considered as not a fair charge to the pea crop, inasmuch as they practically form part of the operations necessary to prepare the land for cultivation of any kind. They may be allowed to stand, however, to show the capacity of the pea crop to cover even this expense, especially as the result from this crop is nearly always much heavier from new land. The costs of the operations were unnecessarily high (as viewed by the flat land agriculturist) owing to the sloping nature of the site and the care necessary in dealing with the crop under such conditions.

Sowing was commenced on the 1st February, 1910, and finished on the 29th March following, an interval of practically two months, Sowing must be undertaken in this gradual fashion, as the crop must ripen in a similar way, to allow for the labour of pulling (which is by no means always available), and to average the crop over the whole marketing season and thus take advantage of the varying prices.

Pulling was started on the 20th April, and continued till the end of August. The price paid for this, the most expensive item in the whole series of operations, was 9d. per bushel, or what is practically the same thing, 4½d. per kerosene tin, and arrangements had to be made in good time to secure the necessary labour.

At this rate, children can make exceedingly good wages; in fact, often more than their parents.

The returns from the 20 acres actually cultivated amounted to £329 6s. 8d. from a yield of 1,930 bushels, or an average price of 3s. 5d. per bushel, though the market prices varied from 2s. to 6s. per bushel. The lower rate was scarcely a paying one, but only a few consignments were sold at this figure. No less than £67 19s. 10d. was paid for pulling.

These items in concise form are:—

				£	s.	d.
Net returns from agents				329	6	8
Less: Preparation of land, 20 acres at £4 14s. 1d. per acre	£94	1	8			
Pulling	67	19	10			
				162	1	6
Net proceeds				£167	5	2

The only further deductions from this were a few small items for bags and twine, which did not in every case represent special purchases, and the cost of carting to the station, 8 miles away. As this was done in many cases while other products were being taken, the cost cannot with any accuracy be ascertained. One consignment was, however, carted by a neighbour at 2d. per bushel, a somewhat high rate; but even at this figure, the cost of carting the whole crop would run to but £16 1s. 8d., and with the few items mentioned above, the actual net return, after paying every possible expense, was £150 on an outlay of £250. This result will appear still better when the improvement in the orchard ground is considered, and the fact that the pea vines were raked up, and used as a tasty addition to the menu of the farm stock of horses, cows and pigs.

While an autumn crop is usually of a profitable character, the spring-sown one is somewhat precarious. The reason for this is not far to seek. In the autumn the vines continue growing, and, consequently, forming pods, for a considerable time, while in the spring the vines are short, and the pods comparatively few. Prices, too, are less favourable then, as other vegetables are plentiful. The total yield from the spring crop, after paying for seed, manure, and pulling, was about £40. The actual outlay was thus more than met, and the value of the unutilised manure in the ground for any succeeding crop considerable.

The culture of this vegetable may be recommended to those readers who are living in the elevated districts, such as Gosford and Wyong, where rail communication to the big markets is convenient, as well as those who are located on the rivers.

The desiderata for pea culture may be epitomised thus:—Recently cleared and easily worked ground, a frost-free situation, a slope with a good aspect, ample drainage, a plentiful supply of labour for pulling, and a convenient market. Where these are obtainable, and especially where an attempt is being made to sweeten and build up land for fruit culture, there is no reason why the industry should not be further extended.

Exports and Cold Storage.

H. V. JACKSON.

Rabbits and Hares.

It is estimated that the quantities of rabbits and hares packed and frozen in New South Wales during the year ending 31st December, 1910, were as follow :—

RABBITS.

Works.	January to June, 1910.	July to December, 1910.	Total.
	crates.	crates.	crates.
Country	292,542	226,830	519,372
City	52,612	59,859	112,471
Total	345,154	286,689	631,843

The above number of crates equals 15,164,232 single rabbits.

HARES.

The quantity of hares packed was only small :—

January to June	130	crates.
July to December...	1,698	„
Total	1,828	„

Equal to 21,936 single hares.

The quantity of rabbits and hares exported were 8,007,068 pairs, valued at £406,762; being an increase of 834,918 pairs, valued at £77,742, over the exports for 1909.

The rabbit and hare skins exported amounted to 5,650,400 lb., value £329,616; showing an increase on the previous year in value of £169,244.

The value of rabbits and hares frozen, and of rabbit and hare skins exported, totalled £736,378.

Rabbit packing and freezing was carried on during the winter months at works in Sydney as under :—

Birt & Co., Limited, Pyrmont.
Fresh Food and Ice Co., Limited, Darling Harbour.
Metropolitan Ice and Cold Storage Co., Limited, Harris-street.
Sydney Ice Skating Rink and Cold Storage Co., Limited, Harris-street.

Work was continuous at freezing establishments in the country as follow :—

The Country Freezing Co., Limited, Dubbo.
„ „ „ Warrigal.
„ „ „ Blayney.
„ „ „ Young.
„ „ „ Tibbereenah.

The Country Freezing Co., Limited, Gunnedah.
" " " Canowindra.
Bungendore Freezing Co., Limited, Bungendore
Crookwell Refrigerating Co., Crookwell.
W. White, Tumut.
" Cootamundra.
Wilson and Flood, Bathurst.
Narrabri Co-operative Dairy Co., Limited, Narrabri.
Braidwood Freezing Co., Limited, Braidwood.
G. J. Rohr, Wagga.
J. Moore, Orange.
The Lachlan Freezing Co., Limited, Cowra.
The Australian Inland Freezing Co., Limited, Harden.
Robert Little & Co., Millthorpe.
Dunedoo Refrigerating Co., Limited, Dunedoo.

It will be seen from the above that there are twenty freezing works dealing with rabbits in the country at the present time, and it is understood three new works are contemplated.

Poultry and Eggs.

RETURN showing the Interstate transfers into the State of New South Wales of live and frozen poultry and eggs in shell during the period from 1st January to 13th September, 1910:—

State.	Quantity.	Value.
LIVE POULTRY.		
	No.	£
Victoria ...	206	51
Queensland ...	6	16
South Australia ...	31,986	2,726
Tasmania ...	2	2
Total ...	32,200	2,795
FROZEN POULTRY.		
	lb.	£
Victoria ...	22,917	770
Tasmania ...	320	16
Total ...	23,237	786
EGGS IN SHELL.		
	doz.	£
Victoria ...	4,315	210
Queensland ...	55,391	2,198
South Australia ...	440,496	25,146
Western Australia ...	2,020	102
Tasmania ...	3	3
Total ...	502,225	£27,659

The above figures have been obtained through the courtesy of the Collector of Customs, Sydney, who points out that the compiling of particulars of

Interstate transfers was discontinued on 13th September, 1910. It appears, however, that certain records are tabulated by the Sydney Harbour Trust, and the following particulars have been obtained :—

From Interstate ports.

Item.—Eggs in shell.

Month.	Tons.	Value.
1910.		£
October	295	3,758
November	229	2,770
December	123	1,617
Total	647	£8,145

The total value of eggs received from the other States of the Commonwealth during 1910 was, therefore, £35,804, plus the value of those brought in between 14th and 30th September. Omitting that period, this shows a reduction of £8,034 on the value for 1909.

RETURN showing the outward Interstate transfers of poultry and eggs from New South Wales, from 1st January to 13th September, 1910 :—

State.	Quantity.			Value.		
	Australian.	Other.	Total.	Australian.	Other.	Total.
LIVE POULTRY.						
	No.		No.	£		£
Victoria	94	......	94	25	......	25
Queensland	402	......	402	372	......	372
South Australia	38	.....	38	53	......	53
Western Australia ...	11	.....	11	22	......	22
Tasmania	26	......	26	30	......	30
Total	571	......	571	502	......	502
FROZEN POULTRY—Nil.						
EGGS IN SHELL.						
	doz.	doz.	doz.	£	£	£
Victoria	8,539	2	8,541	362	2	364
Queensland . ..	32	.. ...	32	5	......	5
South Australia	......	25	25	......	1	1
Western Australia ...	1	... ..	1	2	......	2
Tasmania	18	......	18	10	......	10
Total	8,590	27	8,617	379	3	382

RETURN showing the imports into the State of New South Wales of live and frozen poultry and eggs in shell during the year 1910 :—

Country whence imported.	Quantity.	Value.
LIVE POULTRY.		
	No.	£
United Kingdom	17	86
New Zealand	21	11
New Hebrides	4	1
Total	42	98
FROZEN POULTRY.		
	lb.	£
United Kingdom	18	2
Japan	2,018	47
Total	2,036	49
EGGS IN SHELL.		
	doz.	£
New Zealand	8	3
Hong Kong	10,481	272
Total	10,489	275

EGGS HELD IN COLD STORAGE.

It is estimated that over 11,600 cases of eggs in shell were held in the cool stores.

The following are the figures for the past thirteen years :—

1898...	... 11,000 dozen.	1905–6 ...	... 288,648 dozen.
1899...	... 93,000 ,,	1906–7 ...	... 150,322 ,,
1900...	... 96,000 ,,	1907–8 ...	... 250,000 ,,
1901...	... 140,292 ,,	1908–9 ...	... 305,044 ,,
1902–3	... 130,524 ,,	1909–10	... 329,976 ,,
1903–4	... 151,128 ,,	1910–11	... 420,372 ,,
1904–5	... 253,908 ,,		

Besides the above, it is estimated that 5,000 tins of pulped eggs were held in stores.

In consequence of the bountiful seasons, and the quantity of rabbits and mutton requiring storage in the metropolis pending shipment, there is a difficulty in some quarters in obtaining the necessary storage accommodation, and there appears to be room under present circumstances for expansion in the way of cool stores in the city.

ESTIMATED LIVE POULTRY on farms and holdings of 1 acre and upwards.

At end of Year.	Fowls.	Ducks.	Geese.	Turkeys.	Other.	Estimated Number of Eggs obtained during Year.
	No.	No.	No.	No.	No.	dozen.
1907 ...	3,092,364	242,782	29,730	211,556	18,573	12,388,700
1908 ..	2,721,986	229,870	25,631	193,613	24,514	11,305,299
1909 ...	2,672,385	257,741	25,878	224,187	36,000	12,096,859

RETURN showing the Oversea Exports of Live Poultry, Frozen Poultry, and Eggs in shell, from the State of New South Wales during the year ended 31st December, 1910.

Destination.	Live Poultry.								Poultry Frozen.				Eggs in Shell.					
	Ordinary.				For Breeding Purposes.													
	N. S. W.		Australian.		N. S. W.		Australian.		N. S. W.		Australian.		N. S. W.		Australian.		Foreign.	
	No.	£	No.	£	No.	£	No.	£	Pairs.	£	Pairs.	£	doz.	£	doz.	£	doz.	£
New Zealand	77	18	...	...	57	144	5	7	12	5	...	...	87	47	6	8	...	...
Fiji	255	62	...	...	68	24	4	5	...	...	...	...	98	9	...	...	6	1
Papua	67	15	...	...	65	20	...	...	...	...	...	...	894	69	...	...	...	...
Ocean Island	225	52	...	...	6	2	...	...	...	...	...	...	600	47	...	...	...	...
Kaiser Wilhelm's Land	35	11	...	...	...	...	...	...	...	...	...	...	96	7	...	...	...	...
Marshall Islands ...	48	10	...	...	7	2	...	...	...	...	...	...	410	32	...	...	...	...
Neu Pommern ...	76	23	...	...	...	...	...	...	54	7	...	...	673	39	...	...	...	...
New Hebrides ...	38	9	7	2	37	19	...	...	...	...	...	...	...	...	...	...	...	...
New Caledonia ...	23	10	...	...	41	88	...	...	...	...	...	...	...	...	...	...	...	...
Philippine Islands ...	94	41	...	...	36	7	...	...	601	290	165	112	...	...	...	...	...	...
South Sea Islands ..	266	60	...	...	33	9	...	...	...	...	...	...	626	40	...	...	94	5
Caroline Islands ...	19	6	...	...	11	5	...	...	...	...	...	...	...	...	...	...	...	...
Norfolk Island ...	14	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fanning Island ...	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Java	...	...	...	...	7	7	...	...	...	...	...	...	...	...	...	...	...	...
Straits Settlements ...	...	...	...	...	89	49	...	...	1,233	655	...	...	...	...	...	...	...	...
Ceylon...	...	...	...	...	9	10	...	...	45	35	...	...	...	...	...	...	...	...
Hawaiian Islands ..	...	...	...	...	...	...	...	...	15	19	...	...	...	...	...	...	...	...
Total	1,241	323	7	2	466	386	9	12	1,960	1,011	165	112	3,484	290	6	8	100	6

QUANTITY of Produce inspected under the Quarantine Act Regulations (Plants) during the six months ending 31st December, 1910.

Description of Plants.		No. of Packages examined.	Quantity (Measure or Weight).	Quantity.				How Released Plants were Treated.	No. of Coverings Treated.
				Passed.	Quarantined.	Released.	Destroyed.		
Bananas	bunches	15,320	...	15,320	...	...	...	...	...
Pines and bananas	cases	4,742	...	4,742	...	...	...	...	...
Fruit	centals	...	55,790½	49,748	6,042½	6,042½	...	Fumigated	11,464
Cereals, &c. ...	,,	...	93,624	92,023	1,601	1,601	...	Milled and cleaned...	772
Vegetables, corms, &c.*	,,	11	2,542	2,381	172	127	28	Picked over... ...	105
Nuts	,,	...	10,409	10,407	2	1	1	Picked over... ...	2
Plants	No.	...	18,897	18,861	36	36	...	Fumigated	1

* 17 centals or parts held in quarantine.

Exports under the Commerce Act.

Permits were issued under the Commerce Act covering goods for shipment as under, from 1906 to 1910:—

	1906.*	1907.	1908.	1909.	1910.
	Packages.	Packages.	Packages.	Packages.	Packages.
Canned fruit	2,335	7,470	9,867	6,244	4,453
Fruit	41,691	242,382	138,962	153,088	150,036
Hares ... ... crates	1,904	12,514	3,289	2,483	2,036
Honey..	12	63	139	116	54
Jam	1,268	6,022	6,149	5,656	4,057
Leather	3,165	9,588	11,375	11,709	13,491
Maize	298	1,414	116	216	1,928
Millet	....	....	.. ..	266	637
Plants...	261	802	893	830	718
Potatoes	21,700	96,290	28,313	36,220	34,027
Rabbits ... crates	37,178	595,396	478,644	594,247	664,836
Seeds	329	7,765	4,068	6,379	9,194
	110,141	979,706	681,815	817,454	885,467

* October, November, and December only.

NEW SOUTH WALES.

Principal Articles Imported Oversea, 1908 to 1910.

Article.	1908	1909.	1910.
	£	£	£
Ale, beer, &c.	143,170	145,484	139,454
Animals	66,198	61,431	206,324
Apparel and attire...	839,235	915,985	1,020,159
Piece goods	2,818,715	3,001,397	3,527,673
Boots and shoes	133,430	132,757	174,897
Cordage and twines	270,103	279,565	276,299
Drugs, chemicals, and medicines ...	296,528	290,237	312,246
Fish—all kinds	206,375	168,882	195,516
Fruits and vegetables	134,115	180,218	122,580
Furniture	88,623	98,434	94,591
Glass and glassware	159,593	160,692	178,734
Gold—coined and uncoined	608,655	587,362	520,236
Grain—rice	120,422	92,845	113,081
Hats and caps	171,826	183,122	151,129
Iron and steel—bar, rod, &c.	335,919	280,639	488,028
Plate and sheet	357,497	579,850	527,926
Leather	138,198	172,548	143,797
Machines and machinery—			
Agricultural	127,292	143,064	215,103
Other	1,447,120	1,484,649	1,358,360
Metal manufactures	1,304,797	1,204,545	1,398,832
Oil—kerosene	125,955	195,964	161,115
Spirits	447,654	465,236	472,686
Sugar	208,782	737,539	307,794
Tea	460,034	475,807	560,475
Timber	710,727	748,629	820,125
Tobacco, cigars, &c.	394,943	269,960	373,364
Wool...	4,682	9,063	2,676
Other articles	7,707,898	7,822,115	9,306,204
Total ... ... £	19,828,486	20,888,019	23,169,404

New South Wales.

Principal Articles Exported Oversea, 1908 to 1910.

Article.		1908.		1909.		1910.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
			£		£		£
Animals, living		....	103,571	....	60,235	... .	82,724
Butter	lb.	18,547,248	875,633	17,987,595	779,792	27,385,201	1,239,639
Coal...	tons	2,558,366	1,347,237	1,582,336	838,809	1,701,434	909,055
Copper—Ingots and matte ...		....	1,051,825	....	1,125,073	....	1,365,424
Gold—Coined and uncoined ...		....	3,562,481	....	2,142,401	....	1,549,287
Grain—Wheat ...	...centals	248,135	92,621	1,913,052	684,901	6,696,971	2,381,142
Flour	,,	354,331	170,382	433,151	231,227	579,923	266,722
Leather		....	296,154	....	281,561	....	337,141
Meats—Mutton and lamb	lb.	44,637,492	526,423	56,384,554	551,796	90,729,476	1,007,883
Rabbits and hares ...	pairs	5,758,847	247,525	7,172,150	329,020	8,007,068	406,762
Oil—Cocoanut	cwt.	79,216	105,392	90,243	123,423	105,069	192,145
Ores...		....	185,034	....	191,272	....	473,548
Skins—Hides		....	207,625	....	261,410	....	245,669
Sheep	No.	2,456,809	287,595	3,680,847	395,674	3,488,622	437,245
Rabbits and hares ...	lb.	3,029,958	139,527	3,135,800	160,372	5,650,400	329,616
Other		....	251,374	....	441,608	....	589,841
Silver, lead, concentrates, &c. ...		....	2,126,945	....	1,572,392	....	1,250,693
Tallow	cwt.	314,806	429,509	530,667	697,566	648,031	976,335
Timber		....	305,781	....	259,096	....	264,211
Tin—Ingots	cwt.	76,185	502,995	73,529	496,684	55,170	428,018
Wool—Greasy and scoured	lb.	277,012,467	11,859,183	292,751,777	12,148,346	332,495,839	14,242,386
All other articles		....	2,205,807	....	2,272,131	....	3,059,965
Total	£	....	26,880,709	....	26,044,789	....	32,035,451

Pie-melons for Stock.

Weather conditions during the past seasons have been very suitable to the growth of pie-melons throughout the Western Districts. During April and May, when very dry conditions occurred, many farmers complained of shortage of water for their stock.

Mr. J. Clark, farmer, of Dapper, 30 miles north-west of Wellington, had recourse to pie-melons for his stock. For twenty-one days some eighteen head of cattle were fed on dry grass and pie-melons. They were in a secured paddock, and obtained no other liquid nourishment than that contained in the pie-melons during this period. I saw the stock and they had fattened during the time. Two of them were milked during the period, and although the flow of milk diminished, the milk was much richer.—Mark H. Reynolds, Inspector.

The Hopetoun Poultry Farm.

GEORGE BRADSHAW.

When the series of articles depicting suburban poultry farms was initiated, it was mentioned that only those of known permanency and prosperity would be described. More than one reason operated towards this decision; perhaps the first being that, as in other businesses, some do not succeed, and of them all poultry-farming is the one in which, if a failure is made, there is a chorus of "I told you so." This arises chiefly from the fact that, in good times as well as bad, each year witnesses more or less failures in almost every business;

Fig. 1.—An inexpensive Fowl-house.

and quite a number of these unfortunates consider themselves born poultry-farmers, and purchase some "going concern" with the salvage from the previous wreck. Nine times out of ten, the farm which was said to have returned to previous owners handsome profits, is either again in the agents' hands, or the stock is compulsorily sold, and the place itself left as a derelict.

Another reason for describing only those of known financial soundness is the fact that scarcely a year passes but we hear of some new venture in poultry-farming. Model houses are built, runs and appliances according to

the poultry books, orthodox in construction, and tenanted with a stock of expensive fowls. Possibly before a dozen eggs are laid on the place, a lengthy, highly-coloured newspaper report appears on the recently established "Roseberry" or "Jersey" Poultry Plant, and its enterprising owner. Places like these rarely succeed. The owner's intentions are good enough, but often the whole capital is expended before any appreciable return has been received from the farm. The hens do not lay as well as was anticipated, the birds become sick, the wire-netting saggy, the owner tired and disheartened with the business; and shortly the lordly-named poultry farm is heard of no more. A description of such a place as this in the first year of its existence would make pleasant reading, but for the purpose of a guide to those wishing to make a living by keeping fowls, would be not only valueless but misleading.

The first farm described, with the methods of its owner, was the Mammoth Poultry Farm, The Spit, Manly. That farm continues its existence with increased stock; and it is well known that since that time the proprietor has purchased an additional farm in the same neighbourhood, all from the profits of the one described. The Permanent Poultry Farm, Belmore, was another one illustrated and described in the *Gazette*. The methods and management are responsible for its continued permanency. The Success Poultry Farm, Bunnerong-road, Botany, was also dealt with, and the continued success of the place has been such that it could carry no more stock. A second farm as heavily stocked, a sort of overflow from the first, is now just as prosperous.

An important feature for would-be poultry-farmers to bear in mind, is that the above three places are widely different in regard to soil, housing, feeding, shade, other accommodation, and general management, all showing that poultry-farming can be profitably carried on in this country without subjection to any supposed orthodox system.

Neither is it a necessity that the owner should serve an apprenticeship to the business. Commencing is a small way, hard work and a determination to make a success were the elements which brought about the financial results of the three farms described. The owner of the Manly farm was a market-gardener, but through dry seasons soon realised that Orpingtons paid better than onions; Leghorns were found to thrive where lettuce failed; while the fruit-fly, which was ruinous to mandarins, fattened the Muscovies. The owner of the Belmore farm is a man of many parts, his latest undertaking before embarking in the poultry business having been assisting to keep the British end up by shouldering a rifle in South Africa. The proprietor of the two Botany farms was employed at a daily wage on a poultry farm in the same district, but the methods employed there were not those which contributed to his success. All this shows that profitable poultry-keeping does not depend upon being actually brought up in the business.

Neither are environment, soil conditions, nor surroundings any guarantee to success. The Mammoth Farm was an abandoned orchard; the Permanent Poultry Farm is carried on in a thicket of eucalyptus saplings; while the Success Poultry Farm, and the No. 2 Success Farm, like many others in that neighbourhood, are amongst the Botany sands.

The Hopetoun Poultry Farm, hereafter described, in relation to the proprietor, soil, housing, environment, and general surroundings, is wholly different from those already mentioned. In one respect only it agrees, and that is its success.

The Proprietor.

The proprietor of the Hopetoun PoultryFarm is Mr. Arthur E. Lloyd, son of Mr. A. L. Lloyd, Chief Surveyor in the Department of Public Works. Mr. Lloyd is an engineer by trade, who graduated at the Eveleigh workshops, and later was attached to the E. and A. marine service, doing several voyages to the East, extending over 3½ years. Mr. Lloyd's health was never excellent, and finding that the voyages afforded no relief from nervous debility, he bade good-bye to flywheel and pistons of the stuffy, evil-smelling engine room, in favour of a home on the land. The result of the change, in Mr. Lloyd's own words, is, "I now feel that life is worth living."

Fig. 2.—An Elysium for Fowls.

The Locality.

When Mr. Lloyd left the marine service in 1906, it was in the interest of his health, and with the intention of taking up poultry-farming, not in a perfunctory, but in a business way. He, therefore, realised that in order to be convenient to markets, to avoid high freights on produce, and to be near the food supplies, his farm must be close to Sydney; and he considered that for the greatest profits it should be within 20 miles of the metropolis. Many other things had to be considered, such as proximity to railway station, soil, shade, elevation, &c., before a place was found approaching that desired.

Every near and outer Sydney suburb was visited. Scores of places were on offer, the one most conforming to the preconceived ideas being secured, and now known as the Hopetoun Poultry Farm. It is 6 acres in extent, situated in Bellamy-street, Pennant Hills, on the Hornsby line, about fifteen minutes walk from the station and 18 miles from Sydney.

The Farm.

Ten or eleven years ago the now well-stocked farm was bush. Someone came along desiring a home and living, purchased 6 acres of land, built a substantial cottage, cleared the ground, fenced and planted 2½ acres of it in an orchard, which included lemons, oranges, apples, pears, peaches, mandarins, persimmons, &c ; nor was the ornamental side overlooked, there being a considerable number of wattles, camphors, peppers, cedars, pines, firs, and bamboos.

Whether the party who transformed the 6 acres of bush into a home and orchard made a fortune during his four or five years' occupancy, or failed to even secure a living, need not be said. Suffice it to say, the cottage, orchard, &c. were in the market in 1906, and this was one of the places visited by Mr. Lloyd, who without much ado secured it as his future home, and shortly after occupation the previous name "Hopetoun" was invested with the affix "Poultry Farm."

At the time of the photographer's visit, the cottage was smothered in a profusion of roses and other flowers, herbaceous plants being in abundance. Honeysuckle and other sweet-smelling creepers were flourishing in their native wildness, converting the fences into hedges of perfumed greenery.

The soil of the farm is a sandy loam over shale, and either through its inherent richness or from applied manure, the trees have flourished to the extent that, though planted in Commonwealth year, numbers of them look many years older. The orange trees were laden with golden fruit, the paler lemons were less numerous, while an avenue of heavily laden exotic persimmons was a sight well worth the visit.

It was remarked to the owner that the place was an orchard rather than a poultry farm ; but while admitting that perhaps the Statistical Department enumerated him as an orchardist, and his place as an orchard, he declaimed any such nomenclature, and added : -"When I began here, I thought the orchard would be a considerable help until I bred sufficient poultry to stock. However, I can assure you that, despite the flourishing looking trees and heavy crops, had the 6 acres been all orchard rather than the 2½, the returns would not equal one-tenth of what I receive from the fowls"

Mr. Lloyd furnished the following illustration. Some time previously he forwarded to Sydney twenty cases of assorted fruits, and after paying freight, commission, &c., he received a cheque for 21s. The same week ten boxes of twelve dozen eggs each were sent to Sydney, and, although not a dear time, the returns were over £7. "Further," said he, "you get one crop of fruit in the year from a tree, or with citrus perhaps two, while the hens produce all the year round. Take a tree with a good crop of two or three cases of fruit. Why a single hen, of even moderate laying ability, will produce twelve dozen eggs in the twelve months, which at last year's price are worth 15s. or 16s. It is true the hen has to be fed, but when you take into consideration the time occupied in pruning the tree, spraying, and otherwise fighting the pests, plucking the fruit, &c., the hen costs less money to keep, while thirty or forty can be healthily kept on the space and surroundings

required to cultivate the orange or other tree." Mr. Lloyd, when reminded that many orchardists made a living from their trees, said, "I do not dispute that, but they must have considerably more than 2½ acres of trees; and you must also recollect that the majority of orchardists keep fowls, which supplement the returns."

It may be mentioned that since the 21s. consignment of fruit to Sydney, a great proportion of the apples, pears, and the large bulk of the other fruit are cooked for the fowls, and mixed with their morning food, the results, from a health point of view, being most satisfactory.

The Houses and Runs.

The farm is divided into sixty runs, mostly 55 feet x 20 feet, and so arranged that a number of fruit or other shade trees are in each. All runs are enclosed with 6 feet wire netting, strained on hardwood posts, a straight

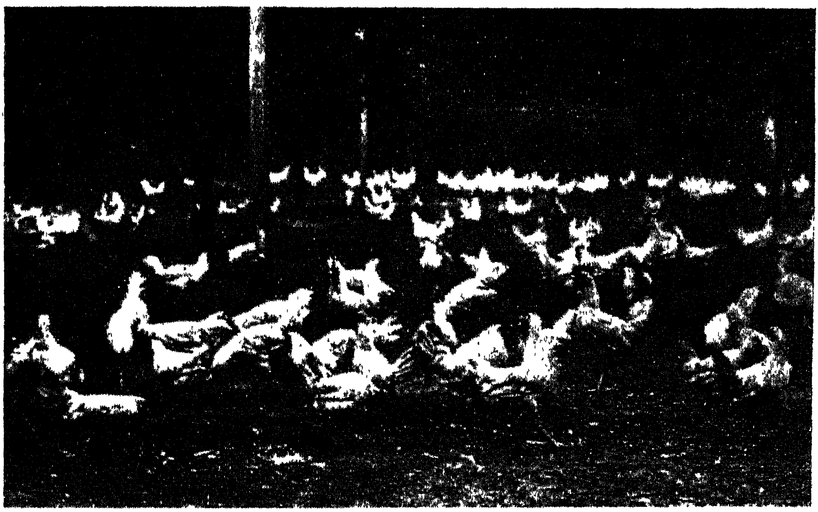


Fig. 8.—Cockerels in preparation for Market.

wire running along top and bottom keeping the netting taut, so that the too common and unsightly sagging is absent. Each run extends from a wide avenue. The backs of the houses face this avenue, there being wire doors for the purpose of cleaning, so that it is unnecessary to enter the pens.

Fig. 7 shows several of these houses. They are 12 feet long, 4 feet 6 inches from front to back, 6 feet high in front, 5 feet 3 inches at back, made of pine weatherboards on hardwood frames, with galvanized-iron roof. The perches are of hardwood, lying loosely on a frame, thus facilitating removal for cleaning purposes and keeping down vermin. The floors are boards, and raised about 2 feet from the ground. The hens can go under this for dusting, or protection from the weather; and also to the nest-boxes, which are along the back of the house and facing the avenue, where, by lifting a hinged flap,

the eggs can be collected. Fig. 5 illustrates this, the proprietor being in the act of collecting the day's eggs. The only nest material is sawdust. This being always dry, there are no stains on the eggs, so that they do not require washing before marketing.

Labour-saving appears to be a special feature of Mr. Lloyd's operations in every portion of the farm. His water-tins are so constructed that they can be filled from outside the run, while a novelty is a feeding-trough, something like a 6 or 8 feet piece of galvanized guttering, which can be drawn out of the run into the avenue, filled with food and pushed back.

The Stock.

Mr. Lloyd commenced, as most successful poultry-farmers have done, in a small way, his first stock consisting of a trio each of White Leghorns and White Wyandottes. From these 200 head were raised the first year, the second about 1,000, the third year 1,500, last year's numbers being about 2,000. The farm is devoted solely to white fowls; and while the Wyandottes were in equal numbers at the start, they are being gradually dropped in favour of an all Leghorn farm. Fig. 6 illustrates the last of the Wyandottes.

In addition to the runs mentioned for the laying stock, there are others of varied sizes for the young birds, breeding pens, &c., and houses of different and simpler construction. One of these is depicted in Fig. 1, the stock being four or five months' old pullets, soon expected to lay.

With the abundant rainfall, the stock of fowls in some of the large runs are not equal to the great growth of grass and other greenstuff. Fig. 2 shows the very favourable conditions for these, which, no doubt, is largely responsible for the excellent egg supply.

Fig. 8 illustrates a cross-section in several runs, all tenanted with layers The great growth, however, prevents many of them from being visible. Fig. 4 shows more layers, with fruit-trees as a shade. Fig. 3 is a pen of about 100 cockerels, some of which were to leave for market the day following the photographer's visit. The breeding season not having begun, the above chickens were the youngest on the farm.

Hatching and Rearing.

The hatching is done by six Cyphers incubators, each of 140 eggs capacity, and usually commences in June, or earlier, if the breeding stock is in condition. The hens which constitute the breeding pens are specially selected for appearance, stamina, and laying qualities, and the male birds to mate with them are individuals selected for their apparent vigour, from the young stock of the season. A number of these are chosen, and from one cause or other weeded out till only the required number are left. Fig. 9 illustrates five of those birds, each of which will be mated to from twelve to fifteen hens, and with a 75 to 80 per cent. hatch, will, in four months, be the parents of 3,000 or more chickens, the number which the farm is expected to carry the forthcoming season. The brooder shed is being considerably enlarged to accommodate the increase in chickens expected this season.

The rearing is done by home-made brooders, eight of them being in operation during the four or five busy months of the season. The chicks are kept in these for about three weeks, and then removed to quarters where artificial heat is not necessary. They are fed from the start on cracked wheat, with some bone, grit, &c., and later weaned on to the same foods as the adults.

The morning meal for the bigger chicks and adults consists of bran, pollard, some molasses, and chopped up greenstuff, an abundance of the latter being grown on the farm. Meat is given at midday. Mr. Lloyd is a great believer in this for eggs, and says that a reduction of eggs will be experienced from its absence in two or three days. Wheat is the usual evening food, alternated with maize. The cost per head per week amounts to but $\frac{5}{8}$d. Mr. Lloyd volunteered to show his books, wherein a record is kept of all receipts and expenditure, the number of eggs gathered, and other items of outlay in connection with the farm.

Fig. 4.—Flowers, fruit, fowls, and a pretty girl.

Marketing.

The farm is conducted for an egg supply, but as with other stock, however much females may be desired, the sexes come nearly equal. Consequently, whether carried on for carcase or eggs, there will always be about the half of the young stock to market. These are sold at various ages, according to the season of the year. There are times when four to five months' old cockerels fetch 5s. or 6s. per couple; at others, 3s. 6d. to 4s. 6d. The prices realised during the past year were as low as 3s. and as high as 6s.

It is well known that hens in their third year will rarely pay more than the food account, and before they reach this age they are sold. Last year's prices were from 3s. to 4s. per couple.

The majority of farmers for eggs say that if the cockerels only fetch what they cost to rear they are satisfied. With the low cost of feeding at the Pennant Hills farm, there should be a reasonable profit in the young males.

Eggs, however, are the principal source of revenue. The best week for these was in October last, when 350 dozens were marketed. The smallest week was in the two-shillings-a-dozen period last year, 120 dozen being the number sold.

The bulk of the eggs and poultry are sold by public auction at Messrs. Strachan and Rone's, Sussex-street; incubator lots and private orders constituting the balance.

Everything on the farm, except the incubators, is made by Mr. Lloyd, even to the lamps of the latter. Fig. 10 shows the neat, 12-dozen egg-boxes, his manufacture, also the stencilling on the sides and lids. All are consecutively numbered. Should one of them from some cause be unreturned, the absent number will be a record of where it was sent.

The eggs are all graded and forwarded weekly to the auction sales, the large ones usually topping the markets, the smaller pullets' eggs fetching two or three pence per dozen less.

Living within 18 miles of the city, it might naturally be supposed that produce would be carted to Sydney. Rather than this all goes by rail; and small wonder when a box of twelve dozen eggs, now worth considerably over £1, is carried by rail to Sydney for 3d., and the box returned free. With such a ridiculous-looking amount for this service, poultry-farmers surely cannot complain of high railway rates.

Regarding transit, the auctioneers say there is scarcely ever a cracked egg, much less a broken one.

General.

The proprietor's profession no doubt contributed to the more profitable nature of his undertaking. Where many others would have had to employ labour to build the houses, erect fences, &c., every construction on the place, from the 3 inch x 1 inch well-dressed hen roosts to the sixty houses, incubator-room, brooders' house and brooders, feed-house and stable, are all the work of his own hands; and to have accomplished all this from the time of purchase, as well as attend to the rearing and management of his fowls is testimony sufficient that nervous debility did not reign long on the farm.

Apart from the houses and other buildings, all the smaller appliances are of his own construction, or waste household things utilised. A simple device converts the ordinary kerosene tin into an excellent water vessel with which each run is furnished. These are placed in a position at the avenue end of each run, the watering of the whole stock being done by means of a small water-barrel mounted on a barrow. A piece of hose is attached to this, the barrow rested opposite the tin, the free end of the hose pointed into a hole in the tin. In a few seconds it is filled and the next one visited. Not many minutes are required to water the whole two thousand or more fowls.

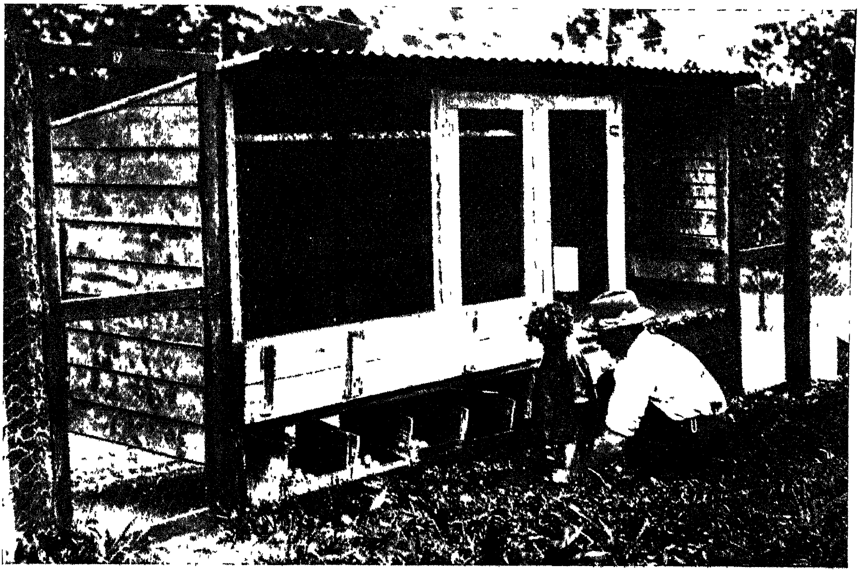


Fig. 5.—Collecting the day's eggs.

Fig. 6.—Experts amongst the Wyandottes.

HOPETOUN POULTRY FARM, PENNANT HILLS.

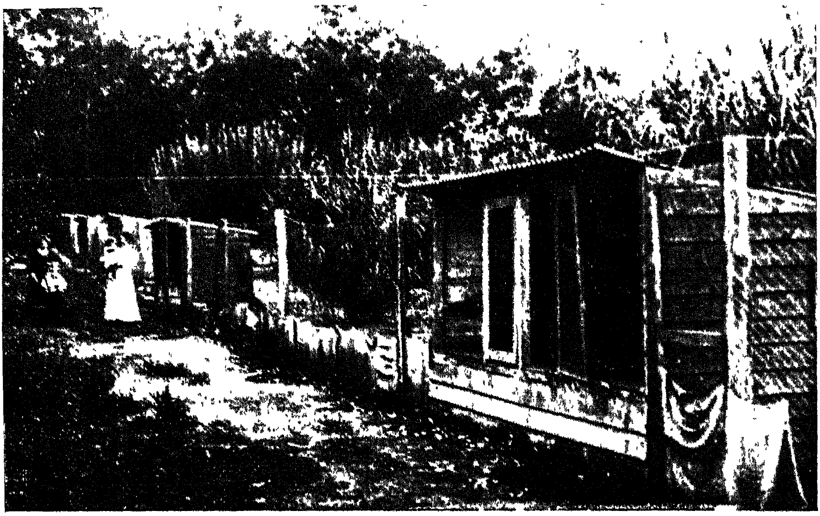


Fig. 7.—Range of poultry-houses. The backs open to facilitate cleaning.

Fig. 8.—Some of the layers, and the only black fowl on the farm.

HOPETOUN POULTRY FARM, PENNANT HILLS.

The hinges and door fastenings of a poultry-yard are not expensive items; still when one hundred of these have to be provided they run into a five-pound note or more; and on the principle that a penny saved is a penny gained, Mr. Lloyd saves the above amount, both articles being simply a few inches of strong galvanised iron, suitably designed, and most effective for the purpose. The same ingenuity in both small and large things is in evidence all over the farm.

When a commencement was made two breeds were intended to be kept—White Leghorns as layers and White Wyandottes for table poultry. These were bred to the present time, but from the second year the Leghorns have been increasing, while the Wyandottes have been allowed to decline in numbers. This change is being brought about from the simple fact that the Leghorns are found the more profitable.

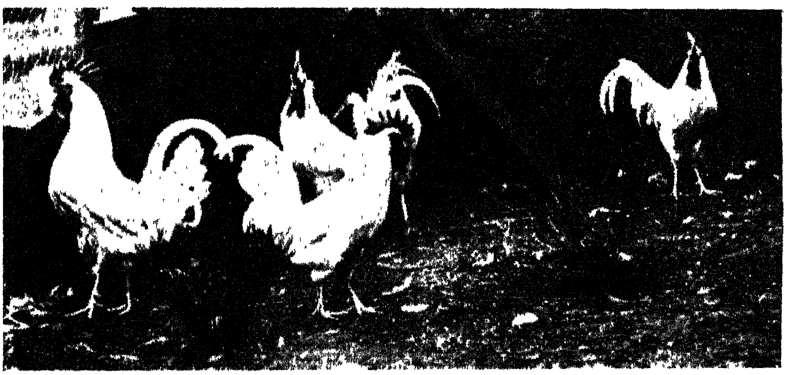


Fig. 9.—A Pen of Cockerels, shortly to be mated.

The Wyandotte cockerels certainly fetch a better price in market, but the experience at Hopetoun Farm is that the few pence less realised for the Leghorn cockerels is compensated by shillings in the excess of eggs laid by the pullets. There is the further fact that if the Leghorn cockerels do not grow as large as the Wyandottes in the same time they consume less food. Mr. Lloyd has not a word to say against the Wyandottes as good utility fowls, but for his purpose has found the others the best.

In addition to meat, Mr. Lloyd is a great believer in greenstuff for his fowls. The bounteous rains of the present season have made the untenanted portion of his farm a forest of grass and weeds of various sorts. This is cut up and mixed in the morning food; while anticipating the time when this is not available, thousand-headed kale, lucerne, barley, oats, and rape are cultivated. This liberal feeding of greenstuff, together with the fruit already mentioned, contributes to the health of the fowls; and on the late visit to the farm, although every one of the two thousand or more birds were under review, not a single seedy-looking one was visible.

Mr. Lloyd says there are occasional cases of sickness amongst them, but he neither drugs them nor keeps an hospital. When any specimen looks ill, if not better in a day or two, he kills it by breaking its neck and burns the carcase, thus preventing any chance of others acquiring the disease.

During the time the farm has been in existence apprentices have been taken. From these a premium was required, and it was evidently well-spent money, some of them now making a living by their own fowls. For a considerable time a paid assistant has been employed.

Financial.

Despite the fact that Mr. Lloyd has constructed every building, shed, and run on the farm, it was a saving of labour only, and while this if totalled up would be a large item, still the timber and wire alone for the many erections amounted to a good sum. Realising this, Mr. Lloyd says that to bring a place such as his from comparative bush to its present state requires a good many sovereigns. But once they have been intelligently spent, and the stock brought up from 1,000 to 3,000 head, all is plain sailing. "A single man," said the proprietor, "can do with much less capital than a married one. He can live in a tent, if he wishes, at a trifling cost, and at the same time be building his houses and rearing his stock, and in a very short time be receiving as much from the fowls as will keep him. With a married man and family it is different. He must have a habitable house, which will cost money, either as rent or by building. He has his family to keep as well as himself, and to begin in the small way I did, whatever sovereigns he has will be required to keep the pot boiling until his returns begin to come in ; and, even then, for a considerable time, there will be outgoing in cash, for my experience is that a poultry-farmer, however successful, is never satisfied. When he has brought his stock to a point when his incomings exceed the outgoings, rather than put a bit in

Fig. 10.—Packing the week's supply for Market.

the bank he increases his stock, and when this gets beyond the capabilities of the farm, he increases, if possible, the acreage."

That there must have been a big outlay on the Hopetoun plant for the first two or three years goes without saying. That, however, is now past, and from the £6, £8, or £10 weekly income from eggs there is only the deduction of the £3, £4, or £5 food bill. Mr. Lloyd intends to rear about 500 Runner ducks from a few now on the farm which have proved to be of a high laying strain. This will help to keep up the returns when the fowls are having a rest.

Concerning the financial results of the farm, the one point of this article is that it is a success. The owner has not been approached about its profits. He volunteers the statement that so many eggs were sold in a week in the height of production, and the lesser number during the scarce season. What they fetched per dozen is not stated, but the auctioneers say they realised at every sale the highest new-laid egg prices.

This being so, those anxious for figuring out the weekly income for eggs alone can do so by the following, which are the average monthly prices for new laids during the past year. The figures are taken from the Government Statistical Bulletin, February issue, which does not give the extreme prices that occasionally obtain for a few dozen parcels, but are the current rates for wholesale lots :—

1910.	s.	d.	1910.	s.	d.
February	1	5½	September	0	10⅛
March	1	8	October	0	10½
April	2	0½	November	0	11⅛
May	2	2	December	1	1¼
June	1	6¾	1911.		
July	1	5	January	1	0
August	0	11	February	1	5¾

The above are the figures for thirteen months, and there is scarcely a doubt but the proprietor's prices reached, if not exceeded them.

It may be stated that, as with other successful poultry breeders, increased stock and extended areas are Mr. Lloyd's ambition, and already several adjoining acres have been added to the original six. Seeing that Pennant Hills is fast becoming an outer residential suburban area, where land is sold by the foot rather than the acre, it can be readily seen that there is money in intelligent poultry-keeping when land costing well nigh £100 per acre can be profitably put to that use.

In conclusion, this farm, like the others previously described, is profitable; but this is not due to any so-called "systems" or advanced methods, environment, or situation. Trap nests, while interesting to the experimentalist, are not in practice here. For the wide, narrow, or balanced ration theories there is no time. Sound wheat and maize, pollard, bran, lots of greenstuff, a good deal of meat, grit, intelligent management, and good Sydney markets are the simple factors, which not only contributed to, but have commanded the continued success.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Alumny and Carr's Creek ...	Mr. A. R. Wetherspoon, Alumny Creek, Grafton.
Bathurst	Mr. S. McKibbin, O'Connell.
Carlingford...	Mr. D. K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown...	Mr. S. A. Levick, Roseneath, Cundletown.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
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Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Yass...	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The list above enumerates the places at which branches have already been formed. The members are receiving the advantage of courses of lectures by Departmental experts on subjects which are of interest to them. Every reader of the *Agricultual Gazette* should join the local branch, or arrange to have one formed in his district. He cannot afford to let go by him such an opportunity of acquiring up-to-date information of modern methods in regard to his business. If a branch of the Bureau does not exist in his neighbourhood, he should write to the Department, and steps will be taken to form one.

Carlingford.

On the 11th April, Dr. Jensen, Assistant to the Chemist, lectured to the members on the "Soils of the District." The lecturer dealt with the chemical composition and agricultural value of soils as formed from the various kinds of rocks. He referred to the several kinds of soil found in the County of Cumberland, and dwelt on the suitability or otherwise of each variety for orchard purposes. In regard to the soils of Carlingford, Dr. Jensen stated that they were principally derived from Hawkesbury sandstone and Wianamatta shale, and emphasised the necessity of the liberal use of lime on these soils, and of green luguminous crops or stable manure, well ploughed in. He considered these methods of treatment superior to the use of artificial manures, which should only be resorted to when a quick result was desired.

Little Plain.

Messrs. T. Walters, of Delungra; A. F. Kemp, W. Gobbert, and E. Hawker, of Gum Flat; E. Kettlewell and W. Leader, of Little Plain; and F. Limbert, of Rob Roy, have joined the branch.

A recent meeting took the form of a discussion on farm implements.

Provided the necessary arrangements can be made with the Inverell Branch, a pruning demonstration will be given on the 7th June at Inverell.

Parkes.

Twenty-one members have joined this branch.

At the last meeting, Mr. Thomas Hamilton read a paper on "Sheep."

Stockinbingal.

The Sheep and Wool Expert continued his course of lectures and demonstrations during May. There was a good attendance of members, Mr. A. Gilmour, chairman, presiding. The lecture was confined to the class of wool more profitable to the farmer, and to the best methods of preparing it for the market. Mr. Mathews exhibited numerous samples of wool, from the finest Merino with 2-inch staple to the Lincoln with 12 inches, as well as a few fleeces to show the different crosses. The exhibit and explanation showed that the most profitable wool for the farmer was a fairly long staple of medium quality, very carefully skirted. To illustrate the manner in which the fleece should be treated in order to gain the best results in the market, the Expert opened, skirted, and rolled a full fleece.

Wagga.

At the annual general meeting of this branch, Mr. E. Crouch was re-elected chairman, with Messrs. T. Scrout and G. Lindon as vice-chairmen. Mr. G. H. Kelsey was appointed honorary secretary and treasurer. The membership fee was fixed at 2s. 6d. per annum, and a regular monthly meeting is to be held on the first Saturday in each month. Two very interesting and instructive papers were read by Messrs. E. Crouch and G. Lindon, delegates to the recent Dry Farming Conference held at Adelaide.

Wallendbeen.

A branch of the Bureau has been formed at this place, Mr. G. F. Sackett being chairman; Mr. W. F. Best, vice-chairman; Mr. W. Forsyth, hon. treasurer, and Mr. W. J. Cartwright, hon. secretary. Thirty-one members have been enrolled, and the annual subscription is 2s. 6d.

On the 29th March, Mr. Veterinary Surgeon Palgrave lectured on "Horses." There was an attendance of thirty, and a great interest was taken in the subject. After the lecture a general discussion took place, and the lecturer was asked many questions.

At the last meeting, Mr. W. F. Best read a paper on the "Destruction of Foxes and Rabbits," which was afterwards discussed by the members.

Yass.

A strong branch is in course of formation at Yass, with Mr. J. B. Duffy as chairman; Mr. J. Connell as vice-chairman; Mr. J. B. Duffy as hon. treasurer; and Mr. S. Mann, of Good Hope, hon. secretary. Mr. Veterinary Surgeon Palgrave recently gave a lecture and demonstration on the "Conformation of the Horse," which a large number attended, and the information was so appreciated that another lecture by Mr. Palgrave was arranged for May, on "Diseases in Horses."

Regular meetings will be held on the third Saturday in each month in the Mechanics' Hall, Yass. The annual fee has been fixed at 2s. 6d.

Veterinary Lectures.

Advices are now being sent to the various branches, asking that arrangements be made for the veterinary surgeons of the Department to deliver lectures as follow:—

13 June	...	Narrandera.	7 July	...	Coonamble.
16 ,,	...	Hay.	11 ,,	...	Peak Hill.
21 ,,	...	Molong.	13 ,,	...	Trangie.
22 ,,	...	Parkes.	13 ,,	...	Macksville.
23 ,,	...	Forbes.	17 ,,	...	Port Macquarie.
23 ,,	...	Grenfell.	17 ,,	...	Denman.
26 ,,	...	Condobolin.	18 ,,	...	Merriwa.
26 ,,	...	Muswellbrook.	19 ,,	...	Cassillis.
27 ,,	...	Casino.	19 ,,	..	Wagga.
30 ,,	...	Scone.	19 ,,	...	Taree.
5 July	...	Gilgandra.	25 ,,	...	Coonamble.
6 ,,	...	Jerilderie.	27 ,,	..	Boggabri.
7 ,,	...	Berrigan.	97 ,,	...	Wellington.

Orchard Notes.

W. J. ALLEN.

JUNE.

Planting.—Where deciduous fruit-trees or vines are to be planted this season, it is best to start the work as early as possible, whether it be for refills in an established orchard, or the planting of a new orchard. The sooner now that any planting is finished the better will be the early root growth, as the roots start to throw out new growth in July. If the soil is dry, however, it would be better to defer the planting until after more rain falls; but wherever there is sufficient moisture, this work should be pushed on to completion.

Plant only such varieties as have proved themselves suitable to the district, and only plant a few varieties. Wherever there are old growers in the district, it is well to be guided by them as to which they consider the best kinds of fruits to plant; then choose the very best varieties of the respective kinds, as it is only the high-grade fruit which is worth growing.

Inter-pollination.—It is claimed by some that where they have blocks of only one variety of apples planted, the crops are not nearly so good nor so regular as when several varieties are inter-planted. Bailey, in his book on the principles of fruit-growing, says, with reference to inter-pollination:—

It is known that some varieties of fruits are self-sterile—that is, they are not fertile with themselves. This sterility may be due, as in the case of the strawberry, to imperfect (or unisexual) flowers, or, more commonly, to pollen which is impotent upon the pistils of the same flower. This infertility, or self-sterility, is largely a varietal characteristic, yet it is no doubt greatly modified by seasonal environmental conditions. It is probable that varieties may sometimes be self-fertile and at other times self-sterile.

There is very little positive knowledge concerning the inter-pollination of fruits, and no subject in pomology is in greater need of study. We chiefly know that the most productive orchards are usually those of many varieties, and that some varieties refuse to fertilise themselves. The safest practice, therefore, is to plant only a few rows, say three or four, of any one variety together, in fruits in which (like many apples and pears) sterility is often apparent.

Strawberries often lack stamens altogether, whilst others, like Crescent, have so few and such poor stamens that they are practically self-sterile. Ordinarily, there should be a row of a perfect-flowered variety for every two rows of pistillate or infertile varieties.

Pruning.—In large orchards, pruning may be pushed on with this month; otherwise there is no hurry until July. This important work should not be neglected if growers wish to get the best results. Judicious summer pruning, combined with the necessary winter pruning, will repay the grower handsomely for the labour incurred.

Weak Trees.—Mark all weak and diseased trees when pruning, so that these can receive special treatment.

Liming.—Many orchards would be greatly benefited by the application of lime, and the present is a very good time to apply same, so that it will have had time to act upon the soil before the spring manuring.

Fruit Fly.—In one or two districts there are still evidences of this pest, but owing to the rigid inspection and the compulsory destruction of all fallen and infested fruits, the damage caused by this enemy is greatly reduced.

Attention should be given to fences, buildings, implements, &c., to see they are properly repaired.

I have to acknowledge receipt of specimens of fruit from the following growers during the past month:—

W. J. Moulder, The Oaks:—A very fine collection of named citrus fruits, comprising in all thirteen distinct varieties.

W. Spinks, of Bulli:—A collection of citrus fruit, showing how the different varieties thrive in the vicinity of our great coal mines. The fruit was adhering to the branches in clusters, and it was hard to imagine how it would be possible for them to hold more fruit.

L. P. Rosen, Epping:—A very fine collection of oranges, mandarins, and grape fruit. The Golden Nugget easily held first place amongst the navels, but the tree is a weak, weeping grower. There were two or three varieties of splendid grape fruit, and a few persimmons of the Dai Dai Maru or Bun variety of enormous size.

Mr. George Brown, of Cessnock, has sent me some specimens of Washington Navel Oranges from two-year-old trees. They are very fine samples indeed. Passion vines are also doing exceptionally well in the district.

Subsoiling Orchard Land.

A Bathurst man, contemplating the planting of 20 acres with apple-trees, asked Mr. W. J. Allen, Fruit Expert of this Department, for his opinion as to the advantages of subsoiling. Mr. Allen replied:—

"I consider subsoiling very essential before planting an orchard. My experience is that trees planted on land that has been subsoiled thrive better than on land that has not been subsoiled. If the whole cannot be done at once it might be done where the trees are to be planted, say in strips 6 to 7 feet wide, and the remainder may be done from year to year, so that the whole might be finished by the third winter."

White Ants and Fruit-trees.

"C. E. W." recently asked for advice as to preventing white ants from damaging young fruit-trees. Mr. W. W. Froggatt, Government Entomologist, replied:—

"The main thing is, before planting, to see that all dead wood is taken out of the ground, and that the ground is thoroughly cleaned up. The trees to be planted should be overhauled, and any damaged roots cut out. We have found that German potash (kainit) will drive white ants out of any soil where it is used as a manure. A pound or so of kainit mixed with the soil when planting should be sufficient for each tree."

Department of Agriculture,
Sydney, 2nd June, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

GUERNSEYS.—Duke of France: sire, King of the Roses (imp.); dam, Rohais Lassie II (imp.); calved 8th August, 1910; colour, lemon and white. Price, **£45.**

Lancaster: sire, King of the Roses (imp.); dam, Shamrock of Illawarra (imp.); calved 27th August, 1910; colour, lemon and white. Price, **£45.**

Peter Pan: sire, King of the Roses (imp.); dam, Vivid's Pet; calved 2nd April, 1910; colour, lemon and white. Price, **£45.**

Phœbus: sire, King of the Roses (imp.); dam, Angel Vivid; calved 12th September, 1910; colour, lemon and white. Price, **£45.**

JERSEY.—Sir Oliver: sire, Sir Jack; dam, Pattibelle; calved 7th September, 1910; colour, whole. Price, **£25.**

HOLSTEIN.—Kiel: sire, Hollander; dam, Lolkje Zuyder Zee; calved 22nd May, 1910; colour, black and white. Price, **£25.**

SHORTHORNS.—Royal Pansy: sire, Royal Hampton X (imp.); dam, Australian Pansy; calved 8th December, 1909; colour, red roan. Price, **£50.**

Australian Pansy is by Airy Knight II from Pansy IV (imp.).

Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRE.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

WOLLONGBAR EXPERIMENT FARM.

AYRSHIRE.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS FOR SALE.

GRAFTON EXPERIMENT FARM.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£
Milkmaid ...	His Worship ...	Dairymaid II ...	6 July, 1905 ...	25
My Love	The Judge	Her Loveliness ...	19 March, 1904 ...	25

H. C. L. ANDERSON,
Under Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ..	Pansy 4th (imp.).	Coff's Harbour ...	20 June, '11.
,, ...	March Pansy ..	Earl March ...	Australian Pansy.	Grafton Farm ..	*
,, ..	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ..	*
Jersey .	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ..	*
Guernsey	Gentle Prince ...	Rose Prince (imp.).	Gentle ...	Trevallyn	20 Sept., '11.
,, ..	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Lismore	20 Nov., '11.
,, ..	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Dunoon	1 Dec., '11.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ..	12 April, '11.
,, .	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	30 Dec., '11
,, ...	Sequel's Lad ...	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Nov., '11.
,, ..	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Billinudgel ...	1 Nov., '11.
,, ...	Hayes' Fido ...	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ..	The Peacemaker	Calm Prince ...	Rose Petersen	Berry	Aug., '11.
,, ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Singleton	22 Oct., '11.
,, ...	Calm Prince ...	Rose Prince (imp.).	Gentle ...	Berry	*
,, ..	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ..	20 Nov., '12.
,, ...	Trengwainton Village Favourite	Trengwainton Village Lad.	Wild Eyes ...	Berry	*
Ayrshire	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm .	*
,, ...	Royal Prince ..	Curly Prince	Rosie 5th ...	Grafton Farm .	*
,, ..	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm .	*
,, ..	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ..	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ..	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ..	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

BARE PATCHES.

IN the April number of the *Journal of Agriculture* of South Australia, Mr. W. A. Hargreaves. M.A., F.I.C., Government Analyst and Chief Agricultural Chemist, gives results of some investigations into the cause of bare patches in soils of ordinary fertility. Seven samples of soils were obtained from different parts of South Australia, and analyses and pot-tests were made. In most cases the sterility was found to be due to the presence of excessive quantities of soluble substances such as sodium chloride (common salt), calcium chloride, manganese, &c. Similar results were obtained from analyses made in the Chemical Laboratory of this Department (*vide* Mr. Guthrie's article in May, 1910, *Gazette*, page 434).

With regard to remedies, Mr. Hargreaves points out that in most of the cases examined the subsoil proved better than the soil, *i.e.*, the salts were more concentrated in the surface soil. Cultivation would tend to reduce this concentration by conserving the soil moisture and preventing evaporation. Drainage would tend to allow the winter rains to wash the salts out of the soil.

At Coolabah (where, however, the cause of the bare patches is not definitely known) Mr. G. L. Sutton, late wheat experimentalist of this Department, found that the application of superphosphate proved an effective remedy in cultivated land (*vide Gazette* for January, 1910, page 71).

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Richmond River A., P., and H. Society (Casino) ...	D. S. Rayner ...	May 3, 4
Orange A. and P. Association	W. Tanner ...	„ 3, 4, 5
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	„ 4, 5, 6
Dubbo P., A., and H. Association	F. Weston ...	„ 10, 11
Dungog A. and H. Association	C. E. Grant ...	„ 10, 11
Coonamble P. and A. Association	J. M. Rees ...	„ 17, 18
Walgett P. and A. Association...	S. E. Johnston ...	„ 17, 18
Central Australian P. and A. Association (Bourke)...	G. W. Tull ...	„ 24, 25
Warren P. and A. Association	C. B. Egan ...	June 7, 8
Brewarrina P. and A. Association	H. L. Cathie ...	„ 7,

Society.	Secretary.	Date.
Hay P. and A. Association	G. S. Camden	July 11, 12
Trangie P. A. and H. Association	J. E. Reynolds	,, 12, 13
Wentworth P., A., and I. Society	W. B. Crang	,, 19, 20
Deniliquin P. and A. Society	L. Harrison	,, 20, 21
Peak Hill P., A., and H. Society	A. Yeo	,, 26, 27
Condobolin P., A., H., and I. Association	A. Turner	Aug. 1, 2
Narrandera P. and A. Association	W. T. Lynch	,, 2, 3
Hillston P. and A. Association	S. I. Gordon	,, 3
National A. and I. Association, Brisbane, Queensland	C. A. Arvier	,, 7–12
Bogan Gate P. and A. Association	B. M. Lowing	,, 8
Trundle P. and A. Association	L. Todd	,, 10, 11
Corowa P., A., and H. Society (Annual Show)	J. D. Fraser	,, 15, 16
Forbes P., A., and H. Association	J. H. Bates	,, 16, 17
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 22, 23, 24
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 22, 23, 24
Parkes P., A., and H. Association	G. W. Seaborn	,, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 29, 30
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton	,, 29, 30, 31
Grenfell P., A., and H. Association	G. Cousins	,, 30, 31
Young P. and A. Association	G. S. Whiteman	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys	,, 6, 7
Ariah Park P., A., H., and I. Association	J. N. Taylor	,, 6, 7
Cowra P. A. and H. Association	J. T. Martin	,, 12, 13
Barmedman A. and H. Association	P. H. Sheahan	,, 13
Cootamundra A., P., H., and I. Association	T. Williams	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith	,, 13
Canowindra P., A., and H. Association	G. Newmon	,, 19, 20
Temora P., A., H., and I. Association	W. H. Byrnes	,, 19, 20, 21
Ganmain A. and P. Association	J. H. Ashwood	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther	Oct. 4
Lismore A. and I. Society	T. M. Hewitt	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd	,, 8, 9

1912.

Kiama A. Association	R. Somerville	Jan. 26, 27
Berry A. Association	C. W. Osborne	Feb. 7, 8
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Central New England P. and A. Association (Glen Innes).	G. A. Priest	Mar. 12, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28

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VOL. XXII. PART 7. JULY 3, 1911.

Agricultural Gazette of New South Wales.

Examination as to Soundness, and Certification of Stallions.

SECOND REPORT, COVERING THE PERIOD UP TO THE END OF THE YEAR 1910.

S. T. D. SYMONS, M.R.C.V.S.,
Chief Veterinary Officer, and Chief Inspector of Stock, New South Wales.

As indicated in the first report on the working of the Government scheme for the examination and certification of stallions, published in the July, 1910, number of the *Agricultural Gazette*, stallions inspected up to the 31st March, 1910, were chiefly brought up for examination at Shows.

This system was found to be faulty for the following reason :—It only permitted the better class of stud horse to be seen, as inferior animals naturally do not appear in Show rings. This alone would be a fatal objection to a continuance of examinations at Shows, as the stallion below Show class is the one which it is most necessary to inspect.

A glance at the results of the inspection at Shows and Parades, which are here included, indicates clearly that Parade inspection reaches animals which are not exhibited at Shows, at least in the "Light" and "Pony" classes.

Analysis of Percentages of Stallions refused Certificates at Shows and Parades.

	Draughts.	Lights.	Ponies.	Total.
	per cent.	per cent.	per cent.	per cent.
Shows	40·83	12·95	11·04	22·61
Parades	38·55	22·57	26·04	29·92

A further criticism of these figures will appear at a later stage of this report.

Again, the publicity attached to the rejection of animals at Shows is not desirable, more especially in view of the fact that the examination is purely voluntary on the part of the owner. An additional reason, if one were necessary, for discontinuing the system, was the necessity of examining all stud horses prior to the commencement of the season.

Arrangements were accordingly made with various Agricultural and Pastoral Associations to hold parades at their headquarters, and in addition other convenient and centrally-situated towns were chosen as parade centres, making a grand total of 139 places outside Sydney which the Government Veterinary Officers attended for the purpose of examining stallions. The parade period extended from 16th June to 30th September, and speaking

generally, these months suited the convenience of stallion owners fairly well. It was found, however, that the times arranged for the extreme west, north-west, North Coast, and various portions of the southern districts could be altered with advantage, and modified arrangements have been completed for the forthcoming season.

As mentioned in the first report, a universal opinion existed that the condition of the horse-breeding industry was such that some Departmental action was necessary. The issue of regulations governing the examination of stallions for the Government Certificate of Soundness and Approval, was the first step taken by the Department of Agriculture. It was also indicated in the report previously referred to, that the possession of more definite information by the Department was necessary before adopting other and perhaps more drastic measures for the improvement of horse-breeding. The reports of the Veterinary Officers engaged on the examination of 1,955 horses at 139 different centres have furnished the Department with a fairly accurate knowledge of the present condition of affairs. Before dealing, however, with the reports referred to, it would be advisable to consider how the present regulations have worked, and to what extent they have carried out the intention of the framers in preventing the use of sires that are either unsound or are below standard as regards type, conformation, and breeding.

Examination Parades.

These have been carried out without a hitch on the part of the Department, and the Veterinary Officer has always been present at the appointed hour to carry out the examinations. One Society only failed to make the necessary arrangements, and with this exception, every assistance was rendered and the scheme favourably received. The Parades have, in the majority of instances, been well attended, and in some districts practically every stallion has been submitted for examination. Taken generally, the Parades have been as successful as a voluntary scheme of this nature could expect to be. As was only to be expected, the better known horse-breeding districts have furnished the greater number of horses.

Grounds for Rejection.

The working of the scheme has given a good opportunity for judging if the list of unsoundnesses classed as "hereditary" are such as are prevalent in this State. Some criticism has appeared in print as to whether some other unsoundnesses, particularly "Navicular Disease," should not have been included in the list. The best answer to this contention is the fact that after examining 1,955 stallions no single case of this disease has been discovered by the Examining Officers. Other unsoundnesses, such as Cataract, have been looked for, and, should any unsoundness not included in the list be found to be prevalent, steps will be at once taken to include it, as is already provided for in the regulations. It is, however, useless to include diseased conditions that only exist to a negligible extent.

The certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval as regards type, conformation, and breeding.

This ground of rejection has been subjected to a fair amount of criticism, the reason of which it is a little difficult to understand, and which must be based on a misapprehension of the fundamental principles of horse-breeding. It should be superfluous to state that a horse deficient in type, conformation, and breeding should not be kept for a sire. The very fact that a horse is deficient or faulty in conformation usually serves to show that he is predisposed to many diseases that are classed as hereditary. Any scheme having for its object the improvement of horses must have its basis on the solid foundation of good conformation. To reject horses affected with various forms of unsoundness, while horses of bad conformation obtain certificates, would simply be trying to remove the effect while leaving the cause in full operation. As will be shown later, much of the bad state of the horses of this State is due to the fact that sufficient care has not been taken to ensure that only sires of good type, conformation, and breeding are used.

Secrecy.

Paragraph 3 reads:—

Until the issue of a certificate, or until the publishing of the official list of certificated stallions, the result of the veterinary examination will not be communicated to any person, &c.

This regulation was framed to make the examination of a stallion entirely a matter which rested between the owner and the Department. If the stallion fails to obtain a certificate, the owner can always learn the reasons for rejection by writing to the Chief Veterinary Officer. This is, under the present conditions of examination, the most satisfactory arrangement, as it precludes the possibility of the information being obtained by unauthorised persons, and the ground for rejection being clearly stated in writing, guards against any misunderstanding that might otherwise arise.

Taken on the whole, the regulations have worked well, especially when it is considered that this is the first year they have been in operation.

Effect upon the Industry.

To the query "Have the regulations prevented the use of unfit sires," it is obviously too early to give a reply. This much, it is certain, they have done:—

(*a*) They have made it extremely difficult to sell an uncertificated stallion, except at a greatly decreased figure; and it is satisfactory to note that stallion owners place a high value on the certificate, as may be seen by the advertisements in the country press.

(*b*) They have made importers more careful to ascertain if horses are sound before bringing them into the State.

(*c*) They have had the effect of teaching owners in a practical manner what the various forms of unsoundness really are. This in itself is good work done, as a great amount of ignorance prevailed on the subject.

However, while the result is satisfactory, instances have already come to hand where persons have deliberately purchased rejected horses on account of the low price, and these have gone to swell the ranks of a class which will be referred to later, which the scheme does not touch.

Although it is not possible to foreshadow the ultimate result of the working of the scheme, it is advisable to point out, even at this early stage, some details which are worthy of the closest attention of the Department. These details are gathered from the reports of the Veterinary Officers engaged in the examinations.

FIRST in importance comes the quality of the stallions examined.

SECOND—and perhaps of greater importance from a Departmental point of view—does the examination reach all the horses which it is desirable to see?

On the first point, the Examining Officers are unanimous in asserting that very few stallions of outstanding excellence capable of improving any breed have come before them; that the vast majority of sires now standing are not pure-bred, but grades or cross-bred animals. Amongst the light horses, bloods have to be excepted from this, and amongst the draughts, Suffolk Punches are in nearly every instance pure. This latter is due to the fact that the breeding of this type is confined to a few breeders of repute, who take every care to ensure purity of type.

On the second point, speaking generally from observation and inquiries conducted on the spot, it may be confidently asserted that the worst stallions in any district do not come before the Examining Officers. The owners of these stallions quite realise that they would have no hope of obtaining a certificate, and hesitate to advertise the inferiority of their horses by placing them alongside better animals at Parades. This class of animal, which is far more numerous than is generally recognised, is responsible for a great amount of damage to the horse-breeding industry. The damage is brought about, directly, by propagating a useless type of animal, and indirectly, by the very small stud fees charged. When, as frequently happens, a large number of inferior stallions, standing at very small fees, exist in a district, it makes it practically impossible for a horse of good quality, and charging a reasonable fee, to exist.

This matter of stud fees has a most important bearing on the whole question of horse-breeding. It certainly does not pay a stallion owner to give a big price for an entire unless he can get a fee for its service sufficient to make it a commercially sound transaction. Unfortunately, there exists a perfect craze for small fees for stud service, and a cheap, inferior horse is the result. A so-called draught stallion can be purchased for as low a figure as £35 (see last Sydney sales). The purchaser will work such an animal in the team, and will serve, perhaps, thirty mares during the season. There is no expense attached to the animal in connection with its stud work, and by the end of the season the owner will have made enough money to have got the horse for nothing. Such an enterprising individual will have many imitators.

Horses such as this are selected, not for their breeding, type, and general excellence of conformation, but simply for their ability to serve mares.

In the ordinary course of events stud fees should be at least 100 per cent. higher than they were fifteen years ago. Such is not the case, however, as they stand at about the same figure. Fifteen years ago the price of a three-year-old draught gelding was £15 to £20, whereas now £35 to £50 has to be paid. With such an increase in value one would naturally suppose that the service fees would increase in a corresponding degree. There must have been keen competition to have kept the service fee so low when the price of the progeny has advanced three-fold.

Now, competition of a kind which is likely to improve the breeding of horses, must have a tendency to increase the value of the source of the supply, viz., the stallion; but high-priced sires, if we except the blood class, are very few in number, and their value bears no proportion to the value of their progeny. By that I mean, that whereas in most horse-breeding countries the value of the sire is somewhere about ten times the average of his get, in New South Wales the value of the sire is on the average not more than two or three times the value of his progeny at three years old. Abnormal conditions inimical to the welfare of the industry must exist to produce this result. I think the inference is plain, and I feel sure that the majority of breeders, who possess a good experience, will agree with me, that it is the undesirable competition from owners of "scrubbers" which has had the effect of causing cheaper, and consequently inferior, horses to be used as sires.

Under normal conditions this policy of breeding from inferior sires would have brought its own punishment, as the progeny would have been unsaleable; but conditions are not normal. Owing to closer settlement, the larger areas being put under cultivation, &c., there is at the present moment a shortage of horses suitable for farm work. Thus the mongrel-bred animal finds a ready sale, and will continue to do so until the more rapid breeding which is now going on, combined with extensive importations from outside the State, has overtaken the demand, when a big drop in prices may be expected, and much of the rubbish now bred will be sold at very considerably reduced prices.

The Defects in the Regulations.

I think it will be conceded that to improve horse-breeding in this State it is absolutely necessary :—

(*a*) To encourage the general use of sires of a type superior to that now standing, and

(*b*) to prevent the use of the mongrel-bred sire.

Now, the regulations, as at present constituted, do neither one nor the other. They are powerless to prevent the use of the "scrubber," which, as already explained, the scheme does not touch; and for this same reason they are of little use in encouraging the use of high-class sires. The regulations have a certain negative educational influence, inasmuch as they indicate that certain

sires should not be used; but to be of real and lasting benefit, they should place such restrictions on the use of uncertificated sires as would have the effect of putting them into a distinctly unfavourable position as compared with the certificated, even if not prohibiting their use altogether. Further, active encouragement might be given to owners of stallions capable of improving existing breeds. It would, therefore, seem advisable that in the near future an Interstate Conference should be arranged, with the view of furthering these objects and arriving at some uniform scheme that would be favourably considered with a view to adoption by all the Governments represented.

Appeals.

Since the inception of the scheme, one appeal only has been lodged against the decision of the Examiners, and this was decided in favour of the appellant. Complaints have at times been made that the regulations governing appeals are too drastic, and do not permit of the horse-owner at a distance taking advantage of them, on account of the expense that would be incurred. That there is little dissatisfaction, however, with the decisions of the Examiners, and thus cause for appeal in any direction, is shown by the fact that sixty-four horses were rejected in Sydney alone during the year 1910, without a single appeal having been made.

Analysis of Defects of Stallions refused Certificates as from 1st June to end of year 1910.

Defects.	Draughts.		Lights.		Ponies.		Total.	
	No. Examined. 817		No. Examined. 731		No. Examined. 407		No. Examined. 1,955	
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Deficient in type, breeding, and conformation.	62	7·58	83	11·35	85 (*a*)	20·88	230 (*a*)	11·74
Sidebone	188 (*a*)	23·01	3 (*a*)	·41	1	·24	129 (*b*)	9·82
Ringbone	48 (*b*)	5·87	42 (*b*)	5·74	8 (*b*)	1·96	98 (*c*)	5·01
Spavin (bone) ...	5 (*c*)	·61	18 (*c*)	2·44	9 (*c*)	2·21	32 (*d*)	1·63
Bog Spavin, Thoroughpin, &c.	7 (*d*)	·85	2	·27	......	......	9 (*e*)	·46
Curb	......	......	13 (*d*)	1·77	3	·73	16 (*f*)	·81
Roarer	5	·61	......	......	......	......	5	·25
Shiverer	......	......	3	·41	......	......	3	·15
Grand Total ...	315	38·55	164	22·57	106	26·04	585	29·92

NOTES.

Draughts—

(*a*) 10 also bog spavin; 7 also deficient in type; 17 also ringbone; 3 also bog spavin and ringbone; 2 also ringbone and deficient in type; 1 also bog spavin and deficient in type.

(*b*) 5 also sidebone; 10 also deficient in type; 2 also bog spavin.

(*c*) 2 also deficient in type.

(*d*) 1 also ringbone.

Lights—

(*a*) 1 also ringbone.

(*b*) 5 also deficient in type; 1 also curb; 1 also spavin and curby hocks; 1 also spavin; 1 also stringhalt.

(*c*) 2 also deficient in type.

(*d*) 2 also ringbone; 1 also deficient in type.

Ponies—

(*a*) 1 also nasal disease.

(*b*) 4 also deficient in type.

(*c*) 6 also deficient in type.

Total—

(*a*) 1 also nasal disease.

(*b*) 10 also bog spavin; 7 also deficient in type; 18 also ringbone; 3 also bog spavin and ringbone; 2 also ringbone and deficient in type; 1 also bog spavin and deficient in type.

(*c*) 5 also sidebone; 19 also deficient in type; 2 also bog spavin; 1 also curb; 1 also spavin and curby hocks; 1 also spavin; 1 also stringhalt.

(*d*) 10 also deficient in type.

(*e*) 1 also ringbone.

(*f*) 2 also ringbone; 1 also deficient in type.

Rejections for Unsoundness.

Of all horses examined, 18·18 per cent. have been refused certificates on the ground of hereditary unsoundness alone. The Victorian percentage for the first year was 15·17. This percentage is not abnormally high, but it must be remembered that Examining Officers have not been too severe in their decisions, and in cases of doubt have usually given the horse the benefit. If the different classes are considered separately, it will be seen that the amount of unsoundness is most unequally divided. The percentages for the three classes are as follow:—

Draughts, 30·97; Lights, 11·22; Ponies, 5·16.

These percentages show that draughts are by far the most unsound, while ponies are remarkably free from unsoundness of an hereditary nature.

Of 1,955 stallions examined, 1,370 have received certificates and 585 have been refused. The percentage of refusals is thus 29·92. This is rather higher than obtained during the first year's examination in the State of Victoria, where the percentage of refusals was 23·05.

Rejections for Conformation, &c.

Of the 1,955 stallions examined, 230, or 11·74 per cent., were rejected on the ground of their being defective in conformation, nondescript in type, or below a reasonable standard for Government approval. Here, again, the Victorian percentages are headed, theirs being 7·88 for the first year's examination.

In explanation of this all-round advance on the Victorian figures, it must not be forgotten that the New South Wales certification scheme came into force three years after the Victorian, and that during that period a large number of the Victorian rejects were dumped into this State.

A consideration of the three classes with regard to rejections for nondescript type, &c., shows a complete reversal as compared with the percentages when hereditary unsoundness only was considered.

The following table illustrates this well :—

	Draughts.	Lights.	Ponies.
	per cent.	per cent.	per cent.
Rejections for hereditary unsoundness	30·97	11·22	5·16
Rejections for deficiency in type or conformation ...	7·58	11·35	20·88

This shows clearly that whereas draughts are the most unsound, they are the best as regards type and conformation. Ponies, on the other hand, if sounder, are yet as a class more mongrel than the other breeds. This can be accounted for in that a great number of stunted animals are misnamed "ponies," being in reality weedy bloods, and trotters are responsible for this.

Arrangements for the Examination Parades of the current season are now complete, a few of the earlier parades having already taken place. Copy of the programme is attached hereto.

STALLION PARADES, 1911.

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Metropolitan—				
3, 4, 5 August... ...	R.A.S. Ground ... August Parade.	10 a.m. daily.	....	....
Every Saturday by prior arrangement with Chief Inspector of Stock.	Stock Office, 56 Bridge-street.	10 a.m. to noon.	....	....
		WEEK ENDING 13 MAY.		
North-West, No. 1—				
Monday, 8 May...	Moree	10 a.m. ...	7·10 a.m., 8th ...	3·45 p.m., 8th.
Tuesday, 9 ,, ...	*Walgett	2 p.m. ...	1·25 p m., 9th...	9·5 a.m., 10th.
Thursday, 11 ,, ...	Burren Junction	10 a.m. ...	12·45 p.m., 10th	9·40 p.m., 12th.
Friday, 12 ,, ..	*Collarenebri ...	2 p.m. ...	12·40 p.m., 12th	10 a.m., 13th.
Western, No. 1—				
Friday, 12 ,, ...	*Bourke	2 p.m. ...	6 p.m., 11th ...	9 a.m., 15th.
		WEEK ENDING 20 MAY.		
North-West, No. 2—				
Friday, 19 May ..	*Warialda ...	2 p.m. ...	11 a.m., 19th ...	11 a.m., 20th.
Western, No. 2—				
Monday, 15 ,, ...	Byrock	2 p.m. ..	11 a.m., 15th ...	3 p.m., 16th.
Wednesday, 17 ,, ...	*Brewarrina ..	2 p.m. ...	6 p.m., 16th ...	8 a.m., 19th.
		WEEK ENDING 3 JUNE.		
Western, No. 3—				
Tuesday, 30 May...	*Nyngan	2 p.m, ...	noon, 30th ...	8 a.m., 31st.
		WEEK ENDING 17 JUNE.		
Southern, No. 1—				
Tuesday, 13 June...	*Narrandera ...	2 p.m. ...	11 a.m., 13th ..	11·45 a.m., 14th.
Wednesday, 14 ,, ...	Whitton... ...	2·30 p.m. ..	1·20 p.m., 14th	1·20 p.m., 15th.
Friday, 16 ,, ..	*Hay	10 a.m. ...	5·25 p.m., 15th	9·20 a.m., 17th.
Northern, No. 1—				
Friday, 16 June ...	Newcastle ..	2 p.m. ...	11·49 p.m., 15th	3·30 p.m., 16th.
Western, No. 4—				
Wednesday, 14 June...	Cobar	10 a.m. ...	4·37 p.m., 13th	10·35 a.m., 15th.
		WEEK ENDING 24 JUNE.		
Southern, No. 2—				
Wednesday, 21 June...	Coolamon ...	10 a.m. ...	9·50 a.m., 21st	4·45 p.m., 21st.
Thursday, 22 ,, ...	Young	10 a.m. ..	10·40 p.m., 21st	6·50 a.m. 23rd.
Friday, 23 ,, ...	*Grenfell	12 noon ...	11·5 a.m., 23rd	1·50 p.m., 24th.
Northern, No. 2—				
Monday, 19 June ...	West Maitland ...	10 a.m. ...	10·48 p.m., 18th	4·25 p.m., 19th.
Friday, 23 ,, ...	Singleton .	10 a.m. ..	10·10 p.m., 22nd	3.35 p.m., 23rd.

* At places marked thus (*) a lantern lecture can be arranged, if desired, in some cases on the day before the parade, and in others the day after, according to times of arrival and departure. Societies concerned will be specially communicated with.

STALLION PARADES, 1911—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
	WEEK ENDING 24 JUNE—*continued.*			
North Coast, No. 1—				
Thursday, 22 June ...	Murwillumbah ...	11·30 a.m.	11 a.m., 22nd ..	3·30 p.m., 22nd.
Friday, 23 ,, ...	Mullumbimby ...	10 a.m. ...	4·24 p.m., 22nd	4·24 p.m., 23rd.
Saturday, 24 ,, ..	Lismore	10 a.m. ..	6 p.m., 23rd .	7·30 a.m., 26th.
Western, No. 5—				
Tuesday, 20 June...	Cumnock ...	11 a.m. ...	10·15 a.m., 20th	3 p.m., 20th.
Wednesday, 21 ,, ...	*Molong	10 a.m. ...	6 p.m., 20th ...	6·14 a.m., 22nd.
Thursday, 22 ,, ...	*Parkes	10 a.m. ...	8·38 a.m., 22nd	9 a.m., 23rd.
Friday, 23 ,, ...	*Forbes	11 a.m. ...	10·3 a.m. ..	
	WEEK ENDING 1 JULY.			
Southern, No. 3— ...				
Tuesday, 27 June...	Murrumburrah ...	9 a.m. ...	5·30 a.m., 27th	6 a.m., 28th.
Wednesday, 28 ,, ...	Henty	11 a.m. ...	10·39 a.m., 28th	4·15 p.m., 28th.
Northern, No. 3—				
Monday, 26 June ...	*Muswellbrook ...	10 a.m. ...	11·15 p.m., 25th	1 a.m., 27th.
Friday, 30 ,, ...	*Scone	10 a.m. ...	11·42 p.m., 29th	12·30 a.m., 30th.
North Coast, No. 2—				
Monday, 26 June ...	Bangalow ...	9·30 a.m. ...	8·20 a.m., 26th	12·30 p.m., 26th (driving).
,, 26 ,, ...	Alstonville ...	3 p.m. ...	2·30 p.m., 26th (driving).	5 p.m., 26th (driving).
Tuesday, 27 ,, ...	*Casino	2 p.m. ...	Noon, 27th (driving).	8·30 a.m., 28th (driving).
Wednesday, 28 June...	Kyogle	Noon ...	11·30 a.m., 28th (driving).	5·35 p.m., 28th.
Thursday, 29 ,, ...	Coraki	10 a.m. ...	9 a.m., 29th (driving).	
Western, No. 6—				
Monday, 26 June...	*Condobolin ...	2 p.m. ...	1·40 p.m., 26th	12·5 p.m., 27th.
Wednesday, 28 ,, ...	Trundle	10 a.m. ...	6 p.m., 27th (driving).	1·40 p.m., 28th.
Thursday, 29 ,, ...	Dubbo	10 a.m. ...	9·8 a.m. ...	6·10 p.m.
	WEEK ENDING 8 JULY.			
Southern, No 4—				
Thursday, 6 July ...	*Jerilderie ...	10 a.m. ...	3·40 p.m., 5th...	3·40 p.m., 6th.
Friday, 7 ,, ...	*Berrigan... ...	10 a.m.	5·25 p.m., 6th..	9·15 a.m., 8th.
Northern, No. 4—				
Monday, 3 July ..	Murrurundi ...	10 a.m. ...	10·32 p.m., 2nd	1·30 a.m., 4th.
Friday, 7 ,, ...	Quirindi	10 a.m. ...	11·35 p.m., 6th	12·27 a.m., 8th.
North Coast, No. 3—				
Thursday, 6 July ...	Maclean	10 a.m. ...	9 a.m., 6th (boat).	— p.m., 6th (boat).
Friday, 7 ,, ...	Grafton	10 a.m. ...	— p.m., 6th ...	8·30 a.m., 8th (driving).
Western, No. 7—				
Wednesday, 5 July ...	*Gilgandra ...	2 p.m. ..	11·53 a.m., 5th	12·40 p.m., 6th.
Thursday, 6 ,, ...	Gulargambone ...	2·30 p.m. ..	2·17 p.m., 6th..	2·3 p.m., 7th.
Friday, 7 ,, ...	*Coonamble ...	3·30 p.m. ..	3·20 p.m., 7th...	10 45 a.m., 8th.

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STALLION PARADES, 1911—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
	WEEK ENDING 15 JULY.			
Southern, No. 5—				
Tuesday, 11 July ...	Deniliquin ...	10 a.m. ...	1·30 a.m., 11th	6·30 p.m., 11th.
Wednesday, 12 ,, ...	Tocumwal ...	Noon ...	11 a.m., 12th ...	4·30 p.m., 12th.
Northern, No. 5—				
Monday, 10 July ...	Werris Creek ...	10 a.m. ...	11·56 p.m., 9th	9·22 p.m., 10th.
Friday, 14 ,, ...	Gunnedah ...	10 a.m. ...	7·23 a.m., 14th	8 p.m., 14th.
North Coast, No. 4—				
Monday, 10 July ...	Coramba	10 a.m. ...	— p.m., 8th ... (driving).	— p.m., 10th (driving).
Tuesday, 11 ,, ...	Bellingen ...	10 a.m. ...	— p.m., 10th ...	— p.m., 11th.
Wednesday, 12 ,, ...	Bowraville ...	10 a.m. ..	— p.m., 11th ...	— p.m., 12th.
Thursday, 13 ,, ...	*Macksville ..	10 a.m. ...	— p.m., 12th ...	— a.m., 14th.
Saturday, 15 ,, ...	Kempsey ...	10 a.m. ...	— p.m., 14th ...	— a.m., 16th.
Western, No. 8—				
Monday, 10 July ...	Narromine ...	10·30 a.m.	10 a.m., 10th ...	10·30 a.m., 11th.
Tuesday, 11 ,, ...	*Trangie	11 a.m. ..	....	....
Wednesday, 12 ,, ...	*Peak Hill ...	2 p.m. ...	....	....
Friday, 14 ,, ...	Warren	12·30 p.m.	12·10 p.m. ...	3·2 p.m.
	WEEK ENDING 22 JULY.			
Southern, No. 6—				
Wednesday, 19 July ...	*Wagga	10 a.m. ...	....	9·20 a.m., 20th.
Thursday, 20 ,, ...	The Rock ...	10·15 a.m.	10 a.m., 20th ...	7 p.m., 20th.
Friday, 21 ,, ..	Corowa	11 a.m. ...	9·40 a.m., 21st	12·40 p.m., 22nd.
Northern, No. 6—				
Monday, 17 July ...	*Denman	2 p.m. ...	12 noon, 17th ..	— a.m., 18th.
Tuesday, 18 ,, ...	*Merriwa	2 p.m. ...	12 noon, 18th ...	— a.m., 19th.
Wednesday, 19 ,, ...	*Cassilis	3 p.m. ..	2 p.m., 19th ..	— a.m., 20th.
North Coast, No. 5—				
Monday, 17 July ...	*Port Macquarie...	10 a.m. ...	— p.m., 16th ...	— a.m., 18th.
Wednesday, 19 ,, ...	*Taree	10 a.m. ...	— p.m., 18th ..	— a.m., 20th.
Thursday, 20 ,, ...	Wingham ...	10 a.m. ..	— a.m., 20th ...	— p.m., 20th.
Friday, 21 ,, ...	Gloucester ...	10 a.m. ...	— a.m., 21st ...	— p.m., 21st.
Saturday, 22 ,, ...	Dungog	10 a.m. ...	— p.m., 21st ...	— a.m., 23rd.
	WEEK ENDING 29 JULY.			
Southern, No. 7—				
Wednesday, 26 July ...	Urana	9 a.m. ...	5 p.m., 25th ...	— p.m., 26th.
Thursday, 27 ,, ...	Lockhart ...	9 a.m. ...	— p.m., 26th ...	2·45 p.m., 27th.
	WEEK ENDING 5 AUGUST.			
Northern, No. 7—				
Tuesday, 25 July ...	*Coonabarabran ...	10 a.m. ...	— p.m., 24th ...	— a.m., 26th.
Thursday, 27 ,, ...	*Boggabri ..	10 a.m. ...	8·24 a.m., 27th	8·24 a.m., 28th.
Friday, 28 ,, ...	Narrabri... ...	11 a.m. ...	9·45 a.m., 28th	5·40 p.m., 28th.
North Coast, No. 6—				
Monday, 24 July ...	Raymond Terrace	2 p.m. ...	— p.m., 23rd ...	— p.m., 24th.
Western, No. 9—				
Tuesday, 25 July ...	Cudal	10 a.m. ...	8·20 a.m., 25th	3·30 p.m., 25th.
Wednesday, 26 ,, ...	Orange	10 a.m. ...	8·53 p.m., 25th	7·5 p.m., 26th.
Thursday, 27 ,, ...	Wellington ...	10 a.m. ...	9·15 p.m., 26th	8·27 a.m., 28th.
Friday, 28 ,, ...	Millthorpe ...	1·30 p.m. ...	11·12 a.m., 28th	4·6 p.m., 28th.

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STALLION PARADES, 1911—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
	WEEK ENDING 12 AUGUST.			
Southern, No. 9—				
Tuesday, 8 August	Cootamundra ...	9 a.m. ...	7 a.m., 8th ...	2·45 p.m., 8th.
Wednesday, 9 ,,	Germanton ...	9 a.m. ...	8·15 a.m., 9th ...	2·10 p.m., 9th.
Thursday, 10 ,,	Junee	10 a.m. ...	5·50 p.m., 9th ...	6·45 p.m., 10th.
Friday, 11 ,,	Albury	10 a.m. ...	7·5 a.m., 11th...	— p.m., 11th.
Western, No. 10—				
Tuesday, 8 August	*Cowra	10 a.m. ...	6·53 p.m., 7th ...	8 a.m., 9th. (driving)
Wednesday, 9 ,,	*Canowindra ...	2 p.m. ...	12 noon, 9th ...	8 a.m., 10th.
Friday, 11 ,,	Carcoar	10 a.m. ...	8·59 p.m., 10th	8·59 p.m., 11th.
	WEEK ENDING 19 AUGUST.			
Southern, No. 10—				
Wednesday, 16 August	Ariah Park ...	10·45 a.m.	....	....
Thursday, 17 ,,	*Ardlethan ...	9 a.m. ...	....	....
Friday, 18 ,,	Temora	9 a.m. ...	4·30 p.m., 17th	5·10 p.m., 19th.
Northern, No. 8—				
Monday, 14 August...	*Inverell	2 p.m. ...	Noon, 14th ...	— a.m., 15th.
Tuesday, 15 ,, ...	*Bundarrra ...	2 p.m. ...	— a.m., 15th ...	— a.m., 16th.
Thursday, 17 ,, ...	*Barraba	10 a.m. ...	— p.m., 16th ...	— p.m., 17th.
Friday, 18 ,, ...	*Manilla	10 a.m. ...	— p.m., 17th ...	7·15 p.m., 18th.
Western, No. 11—				
Tuesday, 15 August...	*Bathurst... ...	10 a.m. ...	3·30 p.m., 14th	12·37 p.m., 16th.
Thursday, 17 ,, ...	Oberon	10 a.m. ...	6·5 p.m., 16th ...	8 p.m., 17th.
Friday, 18 ,, ...	Rylstone... ...	10 a.m. ...	4·49 a.m.	9·28 p.m., 18th.
	WEEK ENDING 26 AUGUST.			
Southern, No. 11—				
Tuesday, 22 August	Barmedman ...	10·30 a.m.	9·55 a.m., 22nd	10·20 a.m., 23rd.
Wednesday, 23 ,,	*West Wyalong...	2 p.m. ...	11·15 a.m., 23rd	2·10 p.m., 24th.
Northern, No. 9—				
Thursday, 24 August...	*Tamworth ...	10 a.m. ...	5 40 a.m., 24th	5·50 a.m., 25th.
Friday, 25 ,, ...	Walcha	10 a.m. ...	10 a.m., 25th ...	5 p.m., 25th.
Western, No 12—				
Tuesday, 22 August	*Mudgee	10 a.m. ...	6 a.m., 22nd ...	6·30 a.m., 23rd.
Wednesday, 23 ,,	Gulgong	10 a.m. ...	7·50 a.m., 23rd	5·45 p.m., 23rd.
	WEEK ENDING 2 SEPTEMBER.			
Southern, No. 12—				
Wednesday, 30 August	*Gundagai ...	10 a.m. ...	8·55 a.m., 30th	9·20 a.m., 31st.
Thursday, 31 ,, ...	Adelong	1 p.m. ...	noon, 31st ...	— p.m., 31st.
Friday, 1 Sept....	*Tumut	9 a.m. ...	— p.m., 31st ...	1·45 p.m., 1st.
Northern, No. 10—				
Monday, 28 August	*Armidale ...	10 a.m. ...	9·10 a.m., 28th	9·10 a.m., 29th.
Tuesday, 29 ,,	*Guyra	11 a.m. ...	10·14 a.m., 29th	7·1 a.m., 30th.
Wednesday, 30 ,,	*Glen Innes ...	10 a.m. ...	8·10 a.m., 30th	8·30 a.m., 31st.
Thursday, 31 ,,	Tenterfield ...	11 a.m. ..	10·36 a.m., 31st	6 p.m., 31st.
South Coast, No. 1—				
Tuesday, 29 August	Wollongong ...	2 p.m. ...	10·50 a.m., 29th	7·15 p.m., 29th.
Wednesday, 30 ,,	Kiama	10 a.m. ...	8·8 p.m., 29th..	8·8 p.m., 30th.
Thursday, 31 ,,	Nowra	10 a.m. ...	8·58 p.m., 30th	1·40 p.m., 31st.

* At places marked thus (*) a lantern lecture can be arranged, if desired, in some cases on the day before the parade, and in others the day after, according to times of arrival and departure. Societies concerned will be specially communicated with.

STALLION PARADES, 1911—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Departs.
	WEEK ENDING 9 SEPTEMBER.			
Central, No. 1—				
Monday, 4 Sept. ...	Dural	11 a.m. ...	10 a.m., 4th ...	5 p.m., 4th.
Tuesday, 5 ,, ..	Richmond ...	11 a.m. ...	11 a.m., 5th ...	4 p.m., 5th.
Wednesday, 6 ,, ...	Penrith	11 a.m. ...	10·30 a.m., 6th	4 p.m., 6th.
Thursday, 7 ,, ...	Camden	noon ...	11·30 a.m., 7th	4·45 p.m., 7th.
Northern, No. 11—				
Wednesday, 6 Sept. ...	Gosford	11 a.m. ...	10·11 a.m., 6th	4·40 p.m., 6th.
Thursday, 7 ,, ...	Wyong	11 a.m. ...	10·48 a.m., 7th	4·42 p.m., 7th.
South Coast, No. 2—				
Tuesday, 5 Sept. ...	*Milton	10 a.m. ...	5 p.m., 4th ...	5 p.m., 5th.
Wednesday, 6 ,, ..	*Moruya	10 a.m. ..	10·30 p.m., 5th	6 a.m., 7th.
Friday, 8 ,, ...	Cobargo	10 a.m. ...	4 p.m., 7th ..	4 p.m., 8th.
Saturday, 9 ,, ...	*Bega	10 a.m. ...	8 p.m., 8th ...	....
	WEEK ENDING 16 SEPTEMBER.			
Southern, No. 13—				
Wednesday, 13 Sept. ...	Burrowa	10 a.m. ...	8 a.m., 13th ...	— p.m., 13th.
Thursday, 14 ,, ...	*Yass	10 a.m. ...	10·30 p.m., 13th	9·40 p.m., 14th.
Friday, 15 ,, ..	*Gunning	10 a.m. ...	11·30 p.m., 14th	11·30 a.m., 16th.
Monaro, No. 1—				
Tuesday, 12 Sept. ...	*Bombala ...	9·30 a.m. ...	12·30 p.m., 11th	1 p.m., 12th.
Wednesday, 13 ,, ..	*Berridale ...	11 a.m. ...	10·15 p.m., 13th	— a.m., 14th.
Friday, 15 ,, ...	*Cooma	10 a.m. ...	— p.m., 14th ...	6 p.m., 15th.
	WEEK ENDING 23 SEPTEMBER.			
Southern, No. 14—				
Monday, 18 Sept. ...	*Goulburn ...	10 a.m. ...	12·40 p.m., 17th	7·20 a.m., 19th.
Tuesday, 19 ,, ...	Crookwell ...	10·30 a.m. ...	10 a.m., 19th ...	3·45 p.m., 19th.
Wednesday, 20 ,, ...	Taralga	noon ...	— p.m., 19th ...	— p.m., 20th.
Monaro, No. 2—				
Thursday, 21 Sept. ...	Queanbeyan ...	10 a.m. ...	4·10 a.m., 21st	10·4 p.m., 21st
Friday, 22 ,, ...	Braidwood ...	10 a.m. ...	8·10 a.m., 22nd	— p.m., 22nd.
	WEEK ENDING 30 SEPTEMBER.			
Southern, No. 15—				
Wednesday, 27 Sept. ...	*Moss Vale ...	10 a.m. ...	3·30 a.m., 27th	8·45 a.m., 28th.
Central, No. 2—				
Monday, 25 Sept. ...	Liverpool ...	10 a.m. ...	— a.m., 25th ...	— p.m., 25th.

* At places marked thus (*) a lantern lecture can be arranged, if desired, in some cases on the day before the parade, and in others the day after, according to times of arrival and departure. Societies concerned will be specially communicated with.

Sheep and Wool for the Farmers.

THE SEARING-IRON *versus* THE KNIFE FOR DETAILING LAMBS.*

J. WRENFORD MATHEWS.

CONCERNING the merits of the searing-iron as compared with the knife for removing lambs' tails, there has existed for some time past considerable difference of opinion among breeders and sheep men in general. The matter has formed the subject of extensive discussions in most of the leading stock journals. No two writers appear to perfectly agree upon this vexed question.

The matter aroused widespread interest, and many devices were put forward for the purpose of carrying out the work of searing, since it was thought in many quarters that the method of searing would at once replace the use of the knife in the detailing of lambs.

The controversy became of sufficient importance to command the attention of the Department of Agriculture, and about this time last year a series of experiments were undertaken at the instance of the then Minister of Agriculture, the Hon. J. Perry, M.L.A.

In compliance with the official minute, a number of lambs were last year placed under observation at the "marking" season. In order that the rival methods should be thoroughly tested, half the lambs were treated with the searing-iron, while the remainder were operated upon with the knife. The information was sought for the benefit of growers in all the leading sheep districts of the State. Furthermore, it was decided to make the experiment cover as wide a range of climate as possible, in order to eliminate any error due merely to special local conditions.

From these considerations, and to make the results comparable for each district concerned, all the Government Farms where operations in sheep and wool were in progress were made experimental centres. The farms concerned were Wagga, Cowra, Bathurst, and Glen Innes. The results are those of one season's experiments only, but they furnish valuable information as to the respective merits of the two methods concerned.

With the mode of treatment and the manner in which the various instruments are applied we have already dealt at some length in an earlier paper. These points formed the basis of an article in this *Gazette* just twelve months ago. Pending the results of the important experimental work then in progress, the matter was allowed to remain in abeyance.

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* Published with the approval of the Experiments Supervision Committee.—ED.

Of the two methods, it was the searing-iron that attracted special interest. As a newer, in fact comparatively recent, innovation, it threatened to completely replace the older and, as certain critics would have had us believe, obsolete method of knifing.

So radically distinct are these two modes that it is difficult to institute a comparison. As compared with the knife, the searing-iron is neither so rapid nor so simple. Considerably more time and trouble, and certainly more expense, are involved in its use. The great advantage claimed for the iron is that loss of blood is prevented, and that thus the growing lamb experiences no check. If this point be proved in its favour, it is undoubtedly a most important consideration.

Another merit alleged for the searing-iron is that it cauterises the wound, and so obviates infection by micro-organisms and consequent death, as from Tetanus or forms of blood-poisoning. These diseases are frequently responsible for considerable mortality. In its details, however, this subject comes more within the scope of the officers of the Stock Branch of this Department. Veterinary Surgeon Sanderson, in an article which appeared in the *Gazette* for October, 1910, discusses fully the various diseases, their symptoms and probable causes. They comprise Tetanus, Malignant Œdema, General Septicæmia (blood-poisoning), and another affection which appears to be a kind of kidney disease. Without, at least, mention of these diseases, our present paper would be incomplete. "Professor Gilruth, of Melbourne Veterinary College," says Mr. Sanderson, "attributes the last-mentioned trouble to inability to eliminate, as rapidly as necessary, the urea and other poisonous substances naturally, and then excessively, present in the blood (owing to rich and abundant diet). . . . Treatment is confined to reducing the lamb's condition by bleeding."

Dr. Tidswell, Director of the Bureau of Microbiology, in reporting upon two lamb carcases forwarded from Wagga Experiment Farm, communicates Dr. Cleland's statement that "the flush of bleeding after the old method of cutting with the knife may clean out any bacteria which may have already gained entrance." He further points out that the bacilli of Tetanus will not grow in the presence of air, and that by forming the scab over the wound, a condition favourable to the development of various forms of blood-poisoning is established.

Thus the weight of evidence would indicate that, in the opinion of both medical men and veterinary surgeons, knifing is preferable to searing, provided of course that ordinary precautions of sterilising the knife and disinfecting the wound be observed. These gentlemen do not express any opinion as to whether the loss of blood succeeding knifing checks to any appreciable degree the subsequent development of the lamb; and, indeed, this is rather a matter for observation in a practical test.

How the Experiments were carried out.

The lambs tested comprised the whole year's drop, in order to guard against error by making as large a number of observations as was conveniently possible. The lambs were weighed at regular monthly intervals from just

before marking until they were weaned. Both ewe and wether lambs were treated. The lambs were marked at a month to six weeks old. They were weighed four times at Cowra and Wagga, five times at Bathurst, and six times at Glen Innes. Their progress after treatment was carefully noted, and all details with respect to the condition of the wound and the time occupied in healing were recorded.

The appended reports by the managers of the different Farms concerned furnish all these details for general information. By reference to the record of weights, the progress of the lambs month by month may be gauged. With the object of allowing for the difference in weight resulting from the earlier maturity of certain breeds as contrasted with others, and the influence of these characteristics on the development of their progeny, the lambs of each cross were equally divided. At "marking" time half of each were operated on with the searing-iron and the other half with the knife.

No actual deaths as a result of marking occurred, so that as far as the onset of definite disease was concerned the experiments afforded little data. There is, however, quite sufficient evidence to dispose of the notion that the loss of blood after knifing seriously checks the subsequent development. The records show no difference, or, at all events, no significant difference, between the lambs that were seared and those which were knifed at any of the weighings. Any difference is in favour of the knifed lambs; but we do not wish to attach any very great importance to this result, particularly since it has been obtained in one season only.

There was, however, a very considerable difference in the nature of the wounds. Those which were seared showed comparatively much greater inflammation, and the wounds took much longer to heal. Whereas those knifed healed quickly and exhibited a clean sore, the seared lambs showed signs of festering, and much swelling was noticeable around the stump, extending along the spine as far as the lumbar region and even further along the back. On breaking the scab, a considerable quantity of pus exuded. Even though the appearance of the part was outwardly healthy, yet the sore had eaten deeply into the bony core of the tail. The lambs knifed had all healed within the month; but in the case of the seared lambs, the inflammation persisted in some cases for five or even six weeks.

EXPERIMENTS IN DETAILING LAMBS, WAGGA EXPERIMENT FARM.

G. M. McKEOWN, Manager.

THE lambs were marked on 18th July, 1910, seventy being docked with the knife, and seventy seared. They were examined on 22nd idem, when, out of the seared lambs examined, all but two showed a good deal of swelling, and these two showed a very slight trace of festering. In all except those two,

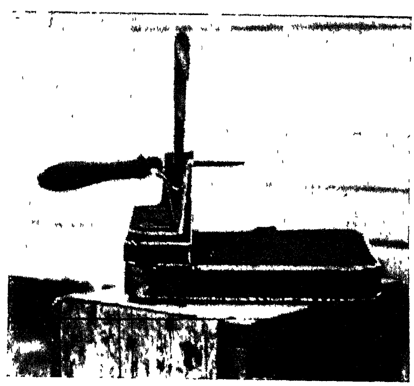
1. Best of knifed lambs.

4. Best of seared lambs.

2. Average of knifed lambs.

5. Worst of seared lambs.

3. Worst of knifed lambs.



The Searing-iron.

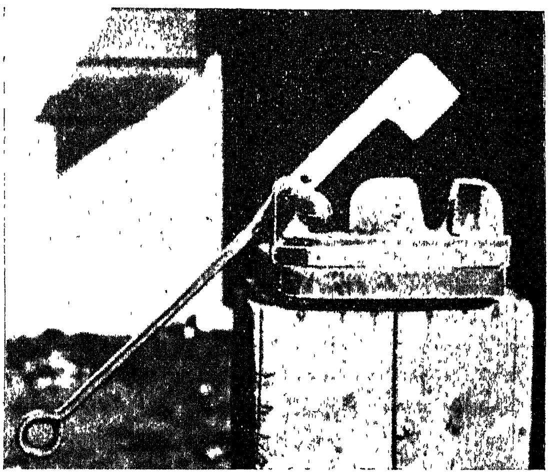
EXPERIMENTS IN DETAILING LAMBS, WAGGA EXPERIMENT FARM, 1910.

Lambs detailed, 15th July, 1910. Photographs taken, 1st August, 1910.

in addition to the swelling, there were traces of festering more or less. The swelling was mostly on the outside of the stump, but did not extend far up.

Of the knifed lambs examined on 22nd July, about twenty in number, only one was found to show any signs of festering, and in no case was there any sign of swelling. The skin was contracting nicely around the tail, and the whole had a healthy pink colour, and showed signs of healing much more quickly than the seared ones.

Owing to the swelling of the skin, in most cases the burnt black stumps of the seared tails were unprotected in any way from the cold. This was not the case with those which had been treated with the knife. Up to this period the discharge of the pus came from between the skin and the flesh of the tail.



Searing-iron used at Wagga Farm.

Second Examination.

On 26th July, eight days after treatment, ten lambs of each class were examined. In all cases the seared lambs showed festering and swelling, though not extending very far up the tail, being mostly confined to the edge of the skin where seared. Only in a very few cases was the skin contracted round the tail and showing any signs of healing.

In the knifed lambs, in only one case was there any sign of festering, and that only very slight. The skin had contracted around the tail, and had commenced to heal to a considerable extent around the edge. The slight festering was close to the bone. In all the other cases examined, the tails were very clean and pink, and had commenced to heal nicely. In no case was there any swelling.

Third Examination.

On 28th July, ten days after treatment, twenty lambs of each class were examined. In nearly all the seared lambs the swelling had not disappeared altogether, being very noticeable around the skin edge ; and of the lambs examined, not one case could be said to be altogether free from festering. In a few cases it was very slight, but in most cases it was very pronounced, as the scab had risen slightly close to the bone. About half the seared lambs examined had made a fair start to heal around the skin edge; but in most cases, in the unhealed parts, the festering showed a very uneven surface, and in some places it had eaten in fairly deeply.

In the twenty knifed lambs examined, no case of festering was found—there being no swelling on any part of the tail—and on an average about one-half of the surface had healed. In some cases the unhealed portion was no larger than a threepenny piece, and in all cases the unhealed surface was very clean and even.

Fourth Examination.

On 1st August, fourteen days after treatment, twenty lambs of each class were examined. The swelling had now all gone from the seared lambs, and in a few cases the festering had ceased. The nearest to being healed showed an unhealed surface about the size of a sixpence, and about half of them had healed to that extent. In four of the remaining ten, the surfaces had not been reduced at all, though they were in a good state of healing, having made a noticeable start all round the edge. The remaining six showed an unhealed surface of about the size of a shilling. In all cases the unhealed surface was rather uneven owing to the effects of festering.

Of the twenty knifed lambs examined, fourteen had healed up entirely. In the remaining six the unhealed space would not average more than the size of a small pea.

Fifth Examination.

On 15th August, one month after treatment, all the treated lambs were examined—seventy in each case.

Of the seventy seared lambs, thirty were found to have healed. In twenty cases the unhealed portion would average about the size of a large pea, and showed no festering. In ten cases the average size was about that of a threepenny piece, and in very few cases was festering noticeable. In the remaining ten the size averaged about that of a sixpence, and in most cases still showed signs of festering.

Of the seventy knifed lambs, only one had not healed. This can be accounted for, as the lamb had received a nasty knock while being photographed on a previous date. There were no hard scabs adhering to the wool of those which had healed, as was the case with the seared lambs, and which showed the large amount of festering that had taken place. Had Stockholm tar not been applied when marking, the tails of the seared lambs would no doubt have been badly affected by flies.

Sixth Examination.

On 20th August, thirty-three days after treatment, thirty-five lambs were examined, and two were found still in an unhealed state.

Weights.

The following table shows the average weights of the lambs seared and knifed on four different dates. The breeds are shown, and the average of all breeds is given hereunder:—

EXPERIMENT in Detailing Lambs, Wagga Experiment Farm, 1910.

Breed.	Average Weights of Lambs.							
	15th July, 1910.		15th Aug., 1910.		15th Sept., 1910.		15th Oct., 1910	
	Seared.	Knifed	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lincoln-Merino	24¼	25¼	34¾	37	50	52	64¼	66½
Dorset Horn-Merino	27¾	27¾	37¾	37¼	54	50	68¾	66
Leicester-Merino	22¼	23	32¼	32¼	45	47	58	59½
Shropshire-Merino	22¾	27¼	34½	37¾	48	51	61	64¼
Border Leicester-Merino ..	23	24½	39	33¾	52	48½	64¾	61¾
Hampshire-Merino	23	21¾	34¼	32¼	48	46	59½	58
South Down-Merino	23	24	33¼	32½	45	45	56½	57¼
Averages on above dates ...	23¾	24½	35¼	34¾	49	48	61½	61½

EXPERIMENTS IN DETAILING LAMBS, COWRA EXPERIMENT FARM.

A. E. DARVALL, Assistant Manager.

THE total number of lambs treated was 213, of which 57 ewe lambs and 51 wether lambs were seared, and 55 ewe lambs and 50 wether lambs were knifed. The lambs were treated and first weighed on 21st June, 1910, and were subsequently weighed three times, at intervals of one month, the last weighing taking place on 21st September, 1910.

When using the searing-iron, the posterior portions of the lambs were protected by a shaped board. The irons, being placed in the fire after each operation, did not require disinfecting. The knife was disinfected after each operation by dipping into a 5 per cent. solution of lysol in water. Stockholm tar was applied to the tails of those lambs which had been knifed, whilst nothing was applied to the tails of those which had been seared.

Each lamb was weighed before using the iron or knife, and to identify it for future weighings, a numbered tag was attached to one ear. The odd numbers were used to distinguish lambs that had been seared, whilst the even

numbers distinguished lambs that had been knifed. Between the first and subsequent weighings, some lambs lost their tags, so that only a smaller number of lambs were available for comparison at the later than at the earlier weighings.

The age of the lambs at the date of treatment ranged between two weeks and eight weeks three days, the first lamb having been dropped on the 23rd April, and the last on the 7th June, 1910.

On the 27th June, 1910, or six days after treatment, fourteen lambs were fly-blown, and of these only one had been knifed, all the remainder having been seared. It was noticed that one lamb, which had been seared, and had been accidentally tarred, was more fly-blown than any of the others. The wounds caused by the searing-iron required more time to heal than did those caused by the knife.

At the first weighing, at time of treatment, the numbers and weights were as follow :—

Treatment.	Number of Lambs.	Average Weight.
		lb. oz.
Seared	108	17 7·7
Knifed	105	17 0·4

Between the first and second weighings, eleven lambs lost their tags, and ten others died, the details of the latter being as follows :—On 22nd June, one seared ewe lamb died, this lamb having been badly fly-blown when first treated. On 29th June, one knifed wether lamb died through weakness, consequent upon being motherless. On 8th July, one knifed ewe lamb died through weakness. On 15th July, four lambs were killed by dogs. On 16th July, one seared wether lamb died from weakness. On 17th July, one strong seared wether lamb died, the cause of death being unknown. On 21st July, one lamb was killed in the yards through crushing. This reduced the number of lambs available for comparison to 192.

At the second weighing the details were as follow :—

Treatment.	Number of Lambs.	Average Weight.
		lb. oz.
Seared	96	25 7·7
Knifed	96	25 2·6

Between the second and third weighings six lambs lost their tags and one seared ewe lamb died. This reduced the number of lambs available for comparison to 185.

At the third weighing the details were as follow :—

Treatment.	Number of Lambs.	Average Weight.
		lb. oz.
Seared	92	35 11·6
Knifed	93	35 5

Between the third and fourth weighings two lambs lost their tags. This reduced the number available for comparison to 183.

At the fourth weighing the details were as follow :—

Treatment.	Number of Lambs.	Average Weight.
		lb. oz.
Seared	92	45 6·6
Knifed	91	44 15·6

No very definite conclusions can be drawn from these results, but the indications are that knifing is slightly better than searing. The blow-flies are less troublesome, the wounds heal more quickly, and it is an easier method.

The following table gives the average weights of the different crosses at the four weighings :—

EXPERIMENT in Tailing Lambs, Cowra Experiment Farm, 1910.

Breed.	Average Weights of Lambs.							
	21st June, 1910.		21st July, 1910.		21st August, 1910.		21st September, 1910.	
	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
Lincoln-Merino ...	17 3·5	17 12·8	26 6	26 5·2	37 5	35 13·6	48 4	45 4·8
Leicester-Merino ...	17 4·6	15 1·2	25 6·5	23 12·7	34 10·5	33 11	44 14·1	43 15
Romney-Merino ...	19 0·8	16 15·5	27 5·6	24 15·5	37 7·5	34 10·7	48 3·7	44 13·8
Shropshire-Merino...	18 1·8	19 9·5	25 14·4	27 9·5	37 12·2	38 8·2	45 7·3	48 6·5
South Down-Merino	15 15·3	16 2·3	23 5·9	23 13·4	34 6·5	34 7·6	42 9·5	42 10·1
Average ...	17 7·7	17 0·4	25 7·7	25 2·6	35 11·6	35 5	45 6·6	44 15·6

EXPERIMENTS IN DETAILING LAMBS, BATHURST EXPERIMENT FARM.

R. W. PEACOCK, Manager.

THE experiment was conducted with 140 lambs, of which 70 were knifed and 70 seared, the breeds being as follow :—

Breed.	No. of Lambs.	
First Crosses—		
Lincoln-Merino	18	
Leicester-Merino	18	
Romney-Merino	15	
		51
Second Crosses—		
Leicester-Dorset Merino	2	
Shropshire-Lincoln Merino	3	
South Down-Lincoln Merino	2	
South Down-Leicester Merino	1	
Shropshire-Leicester Merino	3	
Suffolk-Lincoln Merino	2	
Suffolk-Romney Merino	1	
Dorset-Lincoln Merino	3	
Dorset-Leicester Merino...	2	
		19
Total		70

The detailing of the lambs was completed on 11th July, 1910, but owing to the intervention of wet weather it was not possible to weigh them dry before the 15th idem.

On examining the lambs on 20th July, the Flock Attendant found the tails of fifty-four of the seared lambs badly festered, and seven of them were swollen up the back as far as the shoulders. Only four of the lambs on which the knife had been used required attention. All the affected lambs were bathed with boracic acid and warm water, and they appeared much improved two days after receiving this treatment.

On 28th July the lambs were again examined, when it was found necessary to dress twenty-two of the seared lambs with Jeyes' fluid. On 2nd August the lambs all appeared to have healed.

The table of average weights recorded is appended.

EXPERIMENT in Tailing Lambs, Bathurst Experiment Farm, 1910.

Breed.	Average Weights of Lambs.									
	15th July, 1910.		12th August, 1910.		12th September, 1910		12th October, 1910.		12th November, 1910.	
	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.	Seared.	Knifed.
First Crosses—	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lincoln-Merino	20·5	20·3	27·5	26·7	41·2	41·8	53·1	52·0	64·7	66·5
Leicester-Merino	20·0	20·2	31·2	30·5	41·5	43 6	52·5	57 2	68·3	69·5
Romney-Merino	20·4	20·3	28·8	30·7	42·7	43 8	52·4	55·9	66·9	69·7
Second Crosses—										
Leicester-Dorset Merino	34·0	37·5	39·0	40 5	52·0	61·0	64·3	76·5	81 0	86·5
Shropshire-Lincoln Merino	23·7	23 0	30·6	33·3	48·0	52·6	62·0	64·3	81·6	84 6
South Down-Lincoln Merino	30·5	31·0	38·0	42·5	52·6	55·5	64·3	71 0	72 0	83 5
South Down-Leicester Merino	32 0	29·0	38 0	38 0	52 0	55·0	66 0	67·0	80 0	78·0
Shropshire-Leicester Merino	25·0	25·0	32·5	35 0	50·0	54 6	67·7	68·6	81 0	84·6
Suffolk-Lincoln Merino	20·5	21·5	38·6	35·5	49 6	56·5	64·3	71·0	80 3	86·7
Suffolk-Romney Merino	29 0	31·0	33 0	33 0	56 0	54·0	77·0	74 0	86·0	84 0
Dorset-Lincoln Merino	21·0	21·0	36·5	32 0	58·0	51·3	69·5	67·6	77·5	83·3
Dorset-Leicester Merino	27·0	25·0	34 0	33·5	50 0	53·0	66·5	65 0	71·0	78 0
Averages { First cross...	20·3	20·2	29 2	29 3	41·9	43·1	52 6	55 0	66·6	68·6
Averages { Second cross	26·0	26·1	35 6	36·5	52 0	54·9	66 9	69·5	78·9	83·3

EXPERIMENT in Tailing Lambs, Glen Innes Experiment Farm, 1910–11.

Breed.	Average Weights of Lambs.																							
	21st October, 1910.				21st November, 1910.				20th December, 1910.				2nd February, 1911.				21st February, 1911.				23rd March, 1911.			
	Seared.		Knifed.		Seared.		Knifed.		Seared.		Knifed.		Seared.		Knifed.		Seared.		Knifed.		Seared.		Knifed.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Border Leicester-Merino	23	6	22	10	38	4	56	9	48	3	47	1	55	13	53	8	56	0	54	4	64	1	61	9
Romney-Merino	17	14	20	2	29	1	32	4	36	9	40	2	45	11	47	10	47	4	47	13	54	3	59	7
Lincoln-Merino	22	2	26	1	36	14	40	6	46	7	48	15	53	8	55	6	54	15	56	10	62	5	62	12

EXPERIMENTS IN DETAILING LAMBS, GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

THE breeds comprised in the experiment were Border Leicester-Merino, Romney-Merino, and Lincoln-Merino.

Lambing commenced on 1st September, 1910, and continued until the third week in October. The lambs were marked on the 21st October, being, therefore, from one to seven weeks old, with an average age of about four weeks.

The following table shows the number of lambs of the different crosses at the commencement and at the end of the experiment:—

Breed.	Number at Commencement.	Number at End.	Number Dying during the Experiment.
Border Leicester-Merino	45	38	7
Romney-Merino	29	21	8
Lincoln-Merino	41	35	6
Totals	115	94	21

The deaths were mainly due to the effects of stomach and lung worms, but two lambs were killed for post-mortem examination in connection with another experiment.

The lambs of each cross were divided into two lots, one having the tails severed with the knife, and the other with a hot iron. Each lamb had a distinguishing number tatooed into the ear, which answered the purpose excellently, little difficulty being experienced in distinguishing the numbers.

Each lamb was weighed when marked, and also at intervals of one month up to the age of six months.

When marking it was noticed that where the tail had been severed with a knife it bled considerably, whilst searing caused little or no bleeding.

During the second weighing (one month after marking) it was noted that scabs on the tail were more numerous where the hot iron had been used, but in general scabs were few.

No deaths can be directly attributed to either method, as only four deaths occurred within one month after marking, and these were equally divided.

No signs of Tetanus were apparent in any case.

Table showing the average weights, under the two methods of treatment, at the different weighings is given on page 575.

Wheat-growing in South Australia.

NOTES AND IMPRESSIONS BY DELEGATES TO THE DRY-FARMING CONFERENCE, HELD IN ADELAIDE, MARCH, 1911.

H. C. L. ANDERSON.

A VISIT to some of the principal wheat-growing districts of South Australia will at once convince the visitor of the great prosperity that is now blessing the primary producers, and incidently, of course, the whole of that State. One hears stories in Adelaide about farmers going to market, to church, and to agricultural shows in motor cars, two sometimes belonging to one family, and twenty being seen at one festival. Without being able to certify that this is generally true, one can say that many farmers are retiring from active work at middle age, and are building for themselves very comfortable houses nestling mid verdant orchards and pretty gardens in the nearest townships, and the number of retired farmers, men in the full prime of their lives, enjoying their well-earned leisure, is quite a feature in South Australia.

And whence come these charming flowers, these luscious fruit and grapes, not always to be seen round farmers' houses in our own dry districts? From the great reservoirs of Beetaloo and Bundaleer up in the hills, which supply water in pipes to every farm along 70 miles of road. The Mother State has yet something to learn about water conservation, and incidentally about improving the conditions of living in dry districts.

The principal causes of this prosperity are:—

(1) The greater rainfall of the past five or six years, more especially during the last three.

(2) The increased use of superphosphate, of which 76,500 tons were used last year on 2,100,000 acres, as against 12,500 tons on 250,000 acres in 1898.

(3) The increase in the practice of fallowing, which has risen in the Central district from 23·5 per cent. of the total area under crop in 1896 to 53·3 per cent. last year; in the Lower North there has been an increase from 29·2 to 69·7 per cent.; and in the Upper North, where wheat farming is conducted under special climatic difficulties, the increase has been from 26·7 to 63·4 per cent. In other words, this means that during last season, whilst 1,830,868 acres were under crop, no less than 1,118,492 acres were being fallowed, and the fallows were worked during the summer.

The success due to this combination of causes has been phenomenal, the average yield having risen from 4·64 bushels in 1899 to 13·26 ten years afterwards. A visit to some districts which have very low rainfall gives one cause to think seriously of the climatic conditions of large areas of New South Wales, which are apparently as favourable as those of the whole of the Upper

North of South Australia, where half a million acres are now ploughed for wheat, and also as those of a large part of the Lower North, where 1,200,000 acres are annually cultivated for that crop. It is true that we are not yet growing wheat in our similar areas of low rainfall, but that is due more to the lack of cheap transportation than to want of enterprise in our pioneers or to ignorance of our great potentialities.

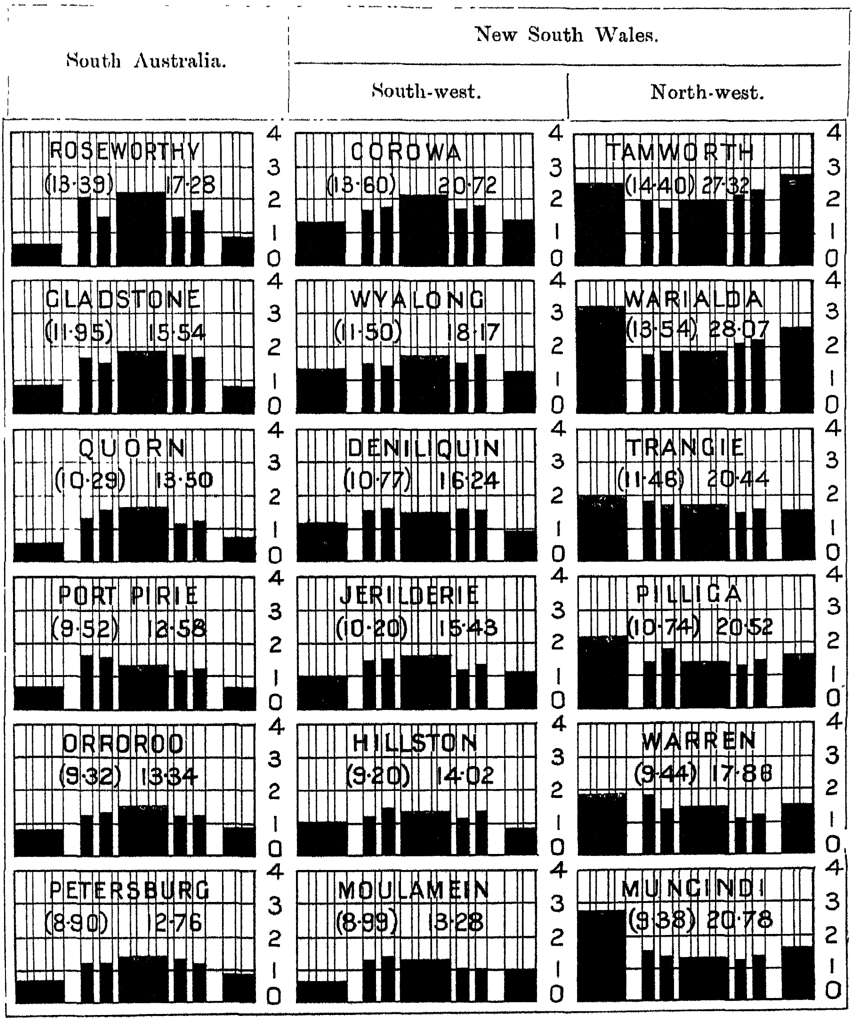
But Victoria and South Australia have pushed railways into dry districts in confident advance of settlement, and the results have justified the bold statesmanship of such a policy. Truly South Australia had some big men when her schemes of water-conservation and of railway branch lines were adopted.

Twenty years ago we were importing wheat from South Australia; this year we are exporting 13,000,000 bushels. And yet we are cultivating only 2,000,000 acres, though we have fully proved our wheat belt to cover ten times that area.

Without repeating any of the points of interest which appealed to all the delegates from New South Wales, and which have been recorded in the interesting notes which they have supplied, I would draw special attention to the seasonal rainfall in six typical wheat districts of South Australia, Roseworthy, Gladstone, Crystal Brook (Port Pirie), Orroroo, Quorn, and Petersburg—and contrast them with the mean rainfall of six places in the Riverina which are not yet fully regarded as being within our wheat belt, and of six places in the west and north-west where wheat-growing is either not yet known or has been very recently introduced.

It will be noted that in order to make the difference between summer and winter precipitation as striking as possible, I have shown the average rainfall for January, February, and March combined, and for November and December combined, so that a glance at these graphs will indicate the relative amount of rain falling during those five summer months when the crop is not occupying the ground, and during the seven months, April to October, inclusive, when the wheat is growing. I have also indicated the average rainfall of the three most valuable months, June to August combined, to show at a glance the difference in the average fall of our north-west district, our Riverina, and some of the dry districts of South Australia. Although the rainfall during the past two years has been generally very much better throughout South Australia than the mean for the past forty years, shown in these graphs, the superiority has been most evident in the more highly favoured districts in the south-east and round about the capital, where the improvement has been as high as 20 to 46 per cent. The mean average, for example, of Adelaide, is 20·38 inches, and the average for the past two years 27·05; at Roseworthy, where the Agricultural College is situated, the mean over a long period of years is 17·28 inches, while the average lately has been 23·77. Generally speaking, in the wheat-growing districts the increase has not been by any means so marked. At none of the places quoted as typical examples (other than Roseworthy) has the rainfall been more than an inch and a half above the mean average for a long series of years.

Average Monthly Rainfalls, South Australia and New South Wales.



EXPLANATION.

The columns show average rainfall for the following months:—

(1) January, February, and March, grouped.
(2) April.
(3) May.
(4) June, July, and August, grouped.
(5) September.
(6) October.
(7) November and December, grouped.

The figures on the right indicate inches. The figures within parentheses show the average rainfall during the wheat-growing period, April to October; and the other figures are the total average annual rainfall at each station.—

H. C. L. ANDERSON.

In order to make a full and fair comparison of these eighteen districts, we should also give the evaporation figures for each, which would be exceedingly interesting as showing how evaporation may be affected by proximity to the ocean or other large sheets of water. The figures for Port Pirie, situated on Spencer's Gulf, are practically the same as those for Crystal Brook, where we were privileged to see a large area of wheat-growing country extending from the township of that name almost to the sea coast, 20 miles away, and to the head of the Gulf at an equal distance. Unfortunately observations of evaporation have not been made, but our own limited experience, as indicated in the map herewith, which shows the evaporation at Dubbo to be nearly 83 inches, and at Sydney 42, goes to prove how much the evaporation may be affected by the situation of a district with regard to great land masses, or its proximity to rivers, lakes, or seas. However favourable may be the evaporation at Crystal Brook, owing to its exceptional position, there can be no doubt about the low rainfall combined with high evaporation and hot northerly winds at such place as Orroroo and Pinaroo, where good results are being got in wheat growing. One of our party remembered his family's experience near Petersburg many years ago, and could hardly credit that wheat could be grown successfully there, unless the seasons have radically changed. If new methods of cultivation and superphosphate have worked the miracle, then all honour to the enterprise and pluck of the South Australian farmers, and the scientific example of their agricultural advisers. The striking point of difference between the rainfall of the southern part of South Australia and the northern part of our own State is the predominance of the winter rains in their case, and of summer rains in ours. The fact remains that with an average rainfall of 8·5 to 12·5 inches during the growing period, good crops of wheat are being grown, ranging from 10 to 25 bushels per acre, and by means of good cultivation, labour-saving appliances, and timely fallowing, wheat-growing has become more prosperous in South Australia, with all the disadvantages of climate, than in any other Australian State.

The lesson to be learnt is, that we have to adapt our system of cultivation to our climatic conditions. We must fallow extensively in winter, so that we may collect and store the summer rains, and we must work the fallows so that the highest percentage possible of that stored moisture may be conserved for the use of the crop between April and October. If we can demonstrate a system of three years' rotation—fallow, fodder crops and wheat—suitable for our districts enjoying a total rainfall as good as, and generally better than that of the six prosperous districts herein described, such a rotation and system as we are now trying at Nyngan and Coonamble, which are both outside the safe wheat belt as at present defined, we shall have extended that belt 50 miles west, and shall have increased the wheat-producing area by 50,000,000 acres. Even if only one-third of this area be under wheat in each year, with one-third under fallow, and the remainder under fodder crops, imagine the greater carrying capacity for farmers' sheep, the enormous increase in our bread supply for the Empire, and the improved social conditions and stability of agriculture as it will be practised in future in large areas given over to closer settlement.

COMPARISON OF SOUTH AUSTRALIA AND NEW SOUTH WALES AS WHEAT-GROWING STATES.

GEO. L. SUTTON, late Wheat Experimentalist.

WHAT must largely impress a New South Wales wheat-grower visiting South Australia is the number of "safe" wheat districts with a low annual rainfall. It is patent that the South Australian farmer is growing wheat successfully and regularly in districts with a much lower *annual* rainfall than is at present considered possible in our own State.

On inquiring into the cause of this, one thing becomes quite certain, that the average *annual* rainfall is no guide to the agricultural possibilities of a district. The agricultural possibilities of districts in New South Wales are not comparable with those of districts in South Australia having a similar average *annual* rainfall. Amongst other things the regularity of the rainfall, and the season of the year when it falls, are quite as important factors to be considered as the total amount of rain that falls.

In many of the dry districts of New South Wales the average annual rainfall, from a South Australian view-point, might be considered satisfactory, and even liberal as regards total quantity. When, however, examined from the same view-point, it would probably be considered unsatisfactory because it fell largely at unsuitable times and was uncertain and irregular. It is evident that in South Australia the rainfall is more regular and falls more opportunely than in New South Wales.

This difference in the character of the rainfall in the two States was clearly brought out by Professor Perkins at Roseworthy. He told the delegates, who were discussing fallowing and watching one of its operations, that there was no need to fear having to practise "dry sowing," because they, in that district, could rely upon getting rain at the sowing season. In New South Wales dry sowing has occasionally to be practised even in some of our safest districts. The Professor's remark certainly indicated that the rains in South Australia were regular and certain, even though they might be scanty.

Possibly, or probably, the rains at planting time were only sufficient because of the methods adopted. It is likely that in New South Wales there are districts, at present unsafe, or hardly safe, which would become *quite* safe if the methods adopted in the Roseworthy and other South Australian districts were adopted in them.

Another factor which favours some of the South Australian wheat districts is their proximity to the ocean. But because of this, harvesting has sometimes to be stopped at 4 in the afternoon. This is because of the sea breeze which springs up, and which so toughens the ears that the grain cannot be stripped.

In the districts traversed by the delegates fallowing seemed universal; not fallowing as understood and practised by many farmers in New South Wales, but fallowing according to modern methods, in which the fallow is worked,

and well worked. In paddock after paddock the eight-horse teams, mostly arranged abreast, were seen drawing the wide cultivators and skim ploughs. The large teams walk rapidly and soon cover a large area.

The farmers in these districts are now so convinced of the advantages of fallowing that rarely indeed, if ever, is wheat sown on stubble land. In the districts visited—Gawler, Crystal Brook, and Wandearah—the day seems past when wheat is sown in a rough and ready way, with little labour, and with a cheerful trust in Providence to do the rest and send abundant rain at opportune times. The farmer, or his father, has possibly learnt by bitter experience that "God only helps those who helps themselves."

The rainfall is regular, but in many districts it is scanty, and the success that has been achieved has been won as the result of hard work. It has been possible, because determined men have thought out and followed proper methods.

The South Australians have the benefit of a timely rainfall; the best farmers, therefore, mean to derive the greatest possible advantage from every drop that falls. As far as their knowledge goes they leave nothing to chance. Their attitude is quite different to that of the average farmer in New South Wales, who puts so little work into the preparation of the land, lest the crop fail and he lose much. The South Australian does not hesitate to put work into the preparation of his soil, because he has learnt that unless he does the crop *shall* fail, and because he is now convinced that the more thoroughly he prepares his land the greater is his chance of securing the maximum return from the rain that falls.

The South Australian works hard. From ploughing time in June, until sowing time in April, he puts in an amount of constant work that would appal the majority of farmers in any of our wheat districts. Living in a country where farming has been followed for a long period, he is probably more conservative, and would now be just as surprised if asked to do less work as the farmer of New South Wales is when asked to do more in order to prepare his land properly.

The South Australian seems keenly alert to devise implements that will suit his peculiar conditions. A noticeable feature in this respect is the advent of a seed and manure box attached to the implements for working the fallow land. Such a machine enables the seed and the manure to be sown at the last working of the fallow, and dispenses with the operation of drilling. There seems no reason why such a practice should lessen the yield. It will unquestionably lessen the cost of production, and seems admirably suited for Australian conditions.

Our present wheat districts seem to possess more natural advantages than those of South Australia. On the whole the soil seems rather richer; nor are weeds so plentiful. But in South Australia the soils are generally lighter, and in this respect are probably better adapted to make the most of a scanty rainfall.

In South Australia the number and growth of weeds is phenomenal. In New South Wales the growth is not nearly as great, and is viewed in many places with complacency, because most of the weeds are good stock feed. In South Australia many of the weeds are valueless in this respect.

Another very serious natural drawback which the South Australian has, and which is not common to our present wheat areas, is that of drifting or blowing sand. At Wandearah it was found that unless special methods were used to counteract its influence, the drifting sand would cut off the young plants as with a knife. Great praise is due to Mr. Birks and others who, as the result of study, have learnt the means of overcoming this difficulty, and have done so.

Another, and probably a more serious aspect of this question is its relation to "take-all," and other fungus pests. It is likely to place the eradication of "take-all" beyond the control of individual farmers. It may require legislative or shire ordinances to deal with it. Because the sand blows from one farm to another, it is possible for the spores of "take-all" and other fungous diseases to be transferred from the farm where methods are not practised for their eradication, on to one on which the very best methods are followed. Where the drifting sand trouble exists, it is essential that every farmer should practise the methods that will control disease; otherwise the farm of one careless man may act as a centre from which the whole district is affected. Education will probably induce or necessity will compel each farmer to practise such methods, but if not he should be forced to practise them.

The farmer in New South Wales has hardly realised how serious "take-all" is. It is well that he should do so, in order that he may be on the alert to control it. As an illustration of its destructive character, a farmer at Crystal Brook instanced a case in which 225 out of 250 acres were ruined by this dreaded pest.

It is evident that, owing to their proximity to the ocean, some of the South Australian districts do not experience the hot dry winds which at harvest time are felt in some of our dry areas, especially in the west. This is in contrast to the conditions obtaining during the harvest of our dry areas, and especially the western ones, when, if a breeze springs up, it is generally of such a character that stripping is facilitated.

Though the climatic and other conditions may not be similar in the two States, the farmer in the dry areas of each has everything to gain from the adoption of modern methods. In New South Wales he has rather more to gain from their adoption. Because of the timely rains at sowing time, the advantages of modern methods to the South Australian are not so much that they enable him to conserve moisture and sow when he wishes. The benefit consists largely in that he makes his soil chemically and bacterially active, and so gets it to make the most of a given rainfall.

The adoption of modern methods will enable the New South Wales farmer to secure the same advantages, and in addition will enable him to utilise his irregular rainfall, so that he will be able to sow his wheat at the proper time, whether the rains are timely or not.

SOME AGRICULTURAL IMPRESSIONS OF SOUTH AUSTRALIA.

R. W. PEACOCK, Manager, Bathurst Experiment Farm.

THE delegates of the first Australian Dry-farming Conference, held in Adelaide in March, 1911, were enabled, by the courtesy of the Ministry, to visit some of the wheat-growing areas of that State. The opportunities offered were necessarily limited, and the impressions formed must in no small measure be discounted by the fact that the time at the disposal of the delegates allowed of only a very cursory view of the conditions. Nevertheless the information gained at the Conference, coupled with a knowledge of somewhat similar conditions in limited areas of Victoria and New South Wales, may be taken as sufficient warrant for placing these opinions before readers who are anxious to benefit by the experience of farmers far beyond the pioneering stages of their calling.

What perhaps appeals most to one acquainted with the wheat-growing areas of New South Wales is the very marked dissimilarity of conditions, especially as regards the distribution of the rainfalls. The wheat area of this State which most nearly approximates the conditions of South Australia, is the Southern Riverina.

Fortunately for wheat-growing in South Australia, the limited rainfalls are distributed principally when needed for the growth of the crop, the bulk falling between April and November. The remaining summer months, generally speaking, are very dry. Summer rains are not looked upon with favour by the farmers of the wheat belt, as such encourage weed growth and depreciate the dry pastures. They are not sufficient in quantity to be of any material benefit in providing green picking for stock throughout the very hot weather. The favourable distribution of the limited rainfalls renders it possible to produce heavy and profitable crops with much less precipitation than is required in many parts of New South Wales where the rains fall at less opportune times.

Duty of Rainfall.

The duty of an inch of rain in wheat or other crop production is very much increased if it falls at the right time. A 3-inch fall of rain in midsummer may not do anything like the same duty in the production of wheat as 1 inch falling in either May, November, or intermediate months. This duty, or power of production, of a unit of rainfall, which an inch may be termed, is worthy of more consideration and investigation, and is the only basis upon which production in relation to rainfall may be compared under varying conditions.

An inch of rain may be startlingly efficient when it falls at the critical time between the flowering of the wheat plant and harvest, and may turn to good account all previous falls which might have proved abortive only for it. The

efficiency of an inch of rain is also considerably influenced by the class of soil. A comparatively light soil will give greater returns in wheat with a low rainfall than the heavier, richer class. South Australia has the advantage perhaps in this respect. Many of her wheat areas comprise light loams and sandy soils.

An inch of rain wets much more deeply a light sandy soil than a heavy clay loam. A larger proportion gets below the action of evaporating agents, sun and winds, in light soils, whereas much more is lost from the heavier, richer soils. The efficiency of an inch of rain may be considerably reduced by an abundance falling during the autumn months, which may induce such a rank growth in the crop as to unfit it for doing its best in a season during which nature is not so prodigal with her gifts during the later period of growth. Generally speaking, South Australia does not suffer from this excessive early development, except upon the richer lands. It is far too prevalent in many of the wheat areas of New South Wales.

The rainfall throughout the wheat areas of South Australia ranges from about 10 to over 20 inches average per annum. With the average of 10 inches, wheat has been profitably grown during the last five or six years, it being admitted that the falls for these years have proved extremely favourable as regards their distribution for wheat culture. These areas are looked at rather askance by many of the old pioneers, who have experienced reverses upon country which to-day, owing to a run of good seasons, is being boomed. It is only natural to conclude that with such a low rainfall the margin is too narrow to allow for any faulty distribution of the rainfall. Such faulty distribution must ever be a disturbing factor in such districts, and a shortage during the critical months of October and November must prove disastrous.

A larger margin is possible with a 12-inch average rainfall; and this may be more rightly considered the outpost of the profitable South Australian wheat belt when averages are taken from data available previous to the past six or seven good seasons. Hammond, at the extreme north of Spencer's Gulf; Petersburg, further east; and Pinnaroo, to the south-east, adjacent to the Victorian border, may be classed amongst the outposts; and at these places dry farming, or farming with limited rainfall, has the most meaning for the South Australian.

A factor which must not be overlooked when comparing these places with the dry areas of New South Wales, is their comparative proximity to large water surfaces. Hammond is approximately 30 miles and Petersburg about 55 miles from Spencer's Gulf, whereas Pinnaroo, in the south, is but 100 miles from the Southern Ocean. The ameliorating effects of these water surfaces upon the winds throughout the wheat season must be considerable, and in striking contrast to the extreme aridity affecting the wheat areas of New South Wales.

The slight alkalinity of the South Australian wheat soils probably assists in making the most of the moisture of the atmosphere. This alone should provide excellent material for interesting and profitable research. Some of

the soils suffer from alkalinity. No soils of the present New South Wales belt can compare with these in respect to alkalinity, and thus local problems are set up.

In discussing drought-resistance of plants, it must be borne in mind that many of the plants, such as wheats, barley, and oats, grown with limited rainfalls in South Australia, may not be subjected to serious droughty conditions. The conditions throughout their growth are frequently very favourable, as such is made during the cooler months of the year, during which the bulk of the rains fall.

There is not the slightest doubt but that all summer crops to be successfully grown in the wheat belt, must be more or less hardy and drought-resistant. This is amply demonstrated by the nature of the indigenous flora, and also by the many drought-resistant weeds which take possession of the fields in too many instances. A pressing problem for South Australia is the finding or evolving of drought-resistant fodder plants to provide green pastures for the stock. There is much scope for dry farming in this regard.

If economic plants could be found possessing the hardiness and drought-resistance of such a weed as stink-wort, they would be worth much to the South Australian farmer. The creeping salt-bush (*Atriplex semibaccata*) may be worth considering, especially upon alkaline soils.

The wheat area visited by the delegates was representative of those enjoying average rainfalls of from 15 to 20 inches, and could not be classed amongst the very dry areas of the South Australian wheat belt. Nevertheless the trip provided many features of great interest and much instruction, of which the delegates were pleased to avail themselves

Soils.

Included in this area were soils perhaps too fertile and too heavy for grain production, and which could be more rightly classed as hay lands. The soils included heavy clay loams, sandy loams, sandy soils, drifting sands, calcareous or limestone soils, and alkaline soils. All these require in no small measure different manipulation and treatment, and call for initiative and experience of local conditions upon the part of the farmer. It was not surprising that the inquirer met with a great diversity of agricultural opinions.

Of the soils which have no counterpart, generally speaking, in the New South Wales wheat belt, are the calcareous soils, containing large quantities of travertine and nodular limestone, drifting sands, and alkaline soils.

There were areas of rich clay loams of considerable depth, as was rendered apparent by railway cuttings and erosions by watercourses, which would have responded better to a heavier rainfall. There were sandy loams apparently well adapted to make the most of a limited rainfall. The drifting sands appeared as though they would need timely showers and some coaxing with fertilisers to allow of their doing their best. Yet it may be doing

much of this sandy soil injustice to question its fertility, as it is well known that such soils in dry climates are not subject to leaching of their plant food, and cannot be compared with soils of the same physical characteristics in climates of greater rainfall.

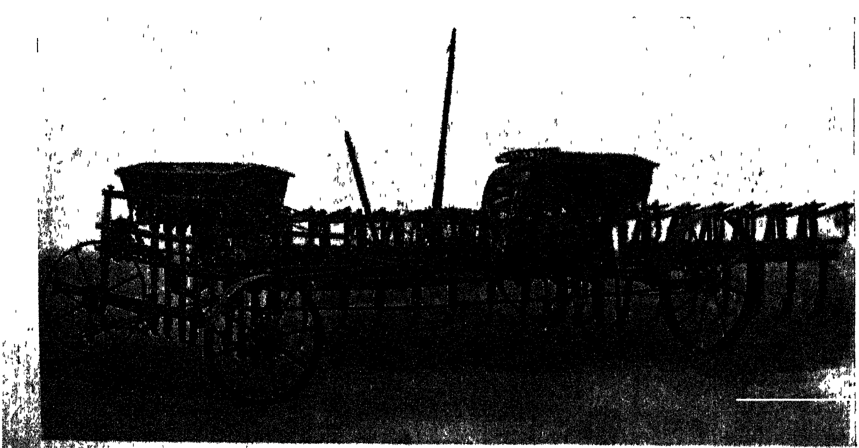
The alkaline soils present problems peculiarly their own, and require treatment to prevent an undue deposition of the injurious salts at the surface. Heavy rains prior to seeding may dissolve the surface salts and leave them less concentrated, allowing of an initial growth of cereals which is admitted to be somewhat difficult to get under certain conditions.

There is also a limited area adjacent to Spencer's Gulf which is influenced by free water within a few feet of the surface. Upon Mr. Birks' farm, which was visited, the water was 10 feet below the surface. The farm itself is only a few feet above sea level.

Methods of Culture.

Various methods are followed by the farmers. That which appeared to be generally aimed at is a triennial system in which wheat is grown once in three years. It is preceded by a lengthy bare fallow of about twelve months. After the wheat is taken off, the land is allowed to run to pasture for twelve months, to be again fallowed for the next crop. Modifications of this are adopted, in which barley or oats may take the place of wheat; the bare fallow period may not be so long, and the period under grass may be lengthened.

It is generally recognised that bare fallowing is imperative. The land is frequently broken up during the autumn before the general seeding time, and after the seeding is finished the fallows are worked to destroy weeds, which work is kept going throughout the spring and early summer. This allows of a bare fallow of from fourteen to fifteen months. A shorter fallow is commenced by breaking up the land after the general seeding. It is considered preferable to break the land in the autumn.



A South Australian Cultivator, with seed and manure attachments.

The bugbear of the South Australian farmer appears to be the weeds, which seem to keep him busy in his attempts to check them. The necessity to destroy weeds appeared to be the main propelling force in keeping the teams on the fallows for many years, the effect of conserving moisture by creating dry soil mulches being very secondary, especially with those not prepared to discuss the question from a soil physics point of view.

This excessive working of the fallows proved troublesome and expensive, necessitating larger plant and greater outlay in wages. As an offset against this the farmer pitted his inventive genius, ably supplemented by the eager collaboration of implement makers. The outcome of it all is that large implements, such as many furrowed ploughs and cultivators of various kinds, have been made to fit in with the practice followed, resulting in very materially lessening the cost of production. Large teams, such as twelve horses abreast, tended by one man or lad, considerably reduce the cheques for wages.

Many excellent fallowed areas were apparent; others there were which left considerable room for improvement. Upon others the implements did not appear to be killing all the weeds; some of the implements were swimming in two or three inches of dusty soil. This was accentuated by the ploughing or cultivating around the paddocks, finishing in the centre. Cross-cultivation would be more effective.

Weeds.

There are weeds and weeds; those which are economic plants simply out of place, and those which may be classed as noxious. The first class, such as wild oats, may be endured if kept within bounds; the second should not be tolerated. Of the noxious class, South Australia, in common with the other States, has its share. Besides being useless for stock, they are robbers of moisture. The following were far too plentiful throughout the area visited:—

Stink-wort (*Inula graveolens*, Desf.).

European Heliotrope (*Heliotropium europæum*), locally known as "potato weed."

Pattersen's Curse (*Echium violaceum*, Linn.).

Wild tobacco (*Nicotiana suaveolens*, Lehm.).

Woolly or Saffron Thistle (*Kentrophyllum lanatum*, DC. et Dub.), locally known as "Star Thistle."

Cockspur (*Centaurea solstitialis*, Linn.).

Bathurst Burr (*Xanthium spinosum*, Linn.).

Upon the fallowed land also a degenerated preserving melon has become a pest, interfering in no small measure with cultivation. This should not be confused with the Wild Melon (*Cucumis myriocarpus*, Naud), so prevalent in New South Wales.

All the above are hardy, vigorous, and in no small measure drought-resistant, and possess deep-foraging tap roots. They also seed profusely, and most of them possess seed appendages which ensure their widespread distribution. Stock will not eat the majority, and only nibble sparingly at the few, and thus cannot be relied upon to keep them in check, but unfortunately assist in their distribution.

It is possible that the practice of allowing the farms to go to indiscriminate pasture for one year out of three has encouraged these noxious growths. Controlling the vegetation by cultivating the stubble lands and sowing suitable fodder crops is worthy of consideration in this regard. As an instance of the effect of such weeds, one paddock visited along the Broughton River could not be harvested on account of the Saffron Thistle. It was estimated that an eighteen or twenty bushel crop was lost.

Native Flora.

The native flora is a reflex of dry conditions. The eucalypts are mostly comparatively low, and comprise different varieties of mallee. Murray River pine and several acacias are the other principal trees. Many varieties of salt-bushes are in evidence. The grasses appeared to be mostly dry, the majority evidently favouring the rainy season for their development.

Water Supply.

The area traversed appeared unfortunate as regards its water supply. Much of the land was not sufficiently retentive to hold water satisfactorily, even if the rainfalls were such as to induce sufficient run-offs to fill the tanks. Most of the free water which could be obtained by sinking wells is too brackish. The cost of carting water was a serious tax upon the pioneers, and naturally restricted their operations and the stocking of their holdings. Large water conservation works have been undertaken by the Government from which water is reticulated throughout the farms by many hundreds of miles of pipes. A water rate of 4d. per acre is charged within 1 mile of the pipes, a reducing charge being made as the distance increases.

This water supply has brought large areas under the plough which otherwise could not be profitably held. It also allows of growing vegetables and flowers, which materially add to the comfort and attractiveness of the homes.

Afforestation.

The lack of timber is a serious drawback in South Australia. Old railway rails are seen doing duty in many ways as telegraph, telephone, and fencing posts. Iron posts are largely used for fences. Many plantations and breakwinds of the South Australian sugar gum may be seen. This tree is easily propagated. Unfortunately it does not last long in the ground when used for posts. Firewood is at a premium in some places. Mallee roots are largely used for this purpose. These roots command 18s. per ton at Port Pirie, and form a considerable offset against the proper clearing of the land adjacent to this port or railway systems. There is no coal in South Australia.

Timber must increase still further in price, and there is ample scope for arboriculture, backed up by the necessity of providing timber and windbreaks. Windbreaks are extremely valuable in preventing the blowing of the light sandy soils. Drifting sands, throughout dry, windy summers, may cover many hundreds of acres of good soil. Various breaks are in evidence, including belts of mallee, native pines, tamarisk, bamboos, acacias, almonds, and sugar gums. Old-man saltbush would be deserving of a place amongst these.

Lucerne.

Lucerne-growing has been tried throughout the wheat belt, but has not proved attractively successful. The summers are far too dry for it to do reasonably well. Notwithstanding this, it is questionable whether there is any crop that would do better or provide as much green fodder throughout the summer. At Roseworthy College some fields were making a very good showing. The rainfall during the summer was above the normal. Upon the flooded lands along the Broughton River, Mr. Jacobs, of Wandearah East, has been successful with this crop. It is stated that he gets three cuttings per year, which are sold at Port Pirie. in green sheaves at 3d. per sheaf. Each cutting sold in this way returns about £15 per acre, or approximately £45 per acre per annum. The visitor naturally asks why all the area along this river, which appears so suitable, is not under this crop. Free water was apparent in a well in one of the lucerne paddocks but 8 feet below the surface. This water-level fluctuates according to the seasons, and was nearer the surface than usual on account of a flood in the spring. One reason that was given why a larger area was not under crop was the difficulty of getting the crops established. This is probably due to the soil being slightly alkaline. The water below the surface was decidedly brackish. Lucerne is difficult to start in alkaline soils, but old plants, on account of their deep-foraging roots, withstand considerable quantities of injurious salts. A good stand would be more easily obtained during wet seasons, or if sown after a good flooding.

Wheats.

Throughout considerable areas rust is prevalent, and rust-resisting varieties are in demand. Especially is this the case where the climate is influenced by winds from the Gulf or sea. Gluyas' Early, Carmichael's Eclipse, Baroota Wonder, and Marshall's, together with many others, have been evolved or selected under the conditions. It is stated that the earliest wheat delivered to any market in Australia is grown beyond Port Pirie, it being harvested at the end of September and early in October.

Settlement.

A most pleasing feature of the area traversed was the concentration of settlement. There were no large unfarmed tracts, such as are too apparent in New South Wales along the railway lines. This desirable concentration renders possible educational advantages and social intercourse appreciated by the rural workers.

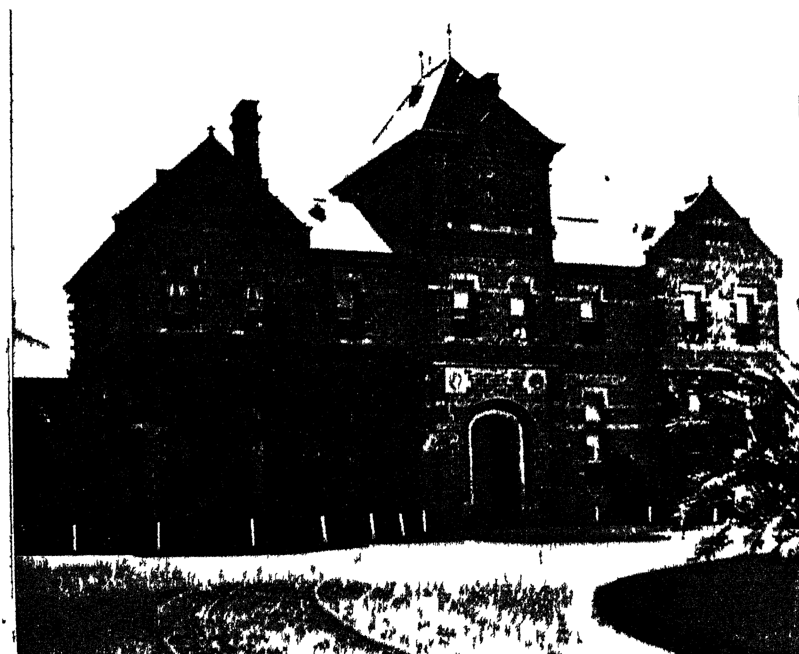
Agricultural Bureaux.

These bureaux have done much for the advancement of South Australian agriculture. Farmers meet together to discuss every phase of their calling. This interchange of ideas and experiences binds the agricultural thought and practice into a progressive whole. They are the machinery that can be set in motion for any movement calculated to benefit the agricultural industry. The State agricultural advisers are brought into touch with the farmers by this medium.

As a practical demonstration of their utility, the members of the Crystal Brook Bureau were ready with horses and vehicles to allow of the delegates making a 40-miles trip amongst the farms. Upon returning, a special meeting was held in the local hall, at which the delegates were invited to give their impressions of the country. Interesting discussions took place, from which all mutually benefited. The cordial welcome given by the farmers, and their keen, appreciative interest in everything agricultural, will ever be remembered by the delegates.

Vehicles on "Goyder Line."

A photograph was taken of the vehicles as they stood on what is known as the "Goyder Line." This line, so it is stated, was mapped out by the Surveyor-General as a boundary between the country possessing, in his opinion, sufficient



Roseworthy Agricultural College, South Australia.

rainfall for wheat and the country having insufficient. There is naturally a considerable overlapping of this line as regards wheat production. Experience, nevertheless, has demonstrated that in the drawing of it ability and discrimination had been brought to bear.

Roseworthy College.

This institution has done much good work, and is continuing to do more for South Australian agriculture. It was here, under the regime of Professor Lowrie, that the advantages of phosphates and fallowing were so ably demontrated. These factors alone have raised the average wheat yields to very profitable levels, and doubled the values of the wheat lands.

Under the management of Professor Perkins, other problems are being solved, and the pace set for progressive agricultural development. Many good farmers have gone through the institution and carried with them into the various agricultural districts educated ideas and methods which have done much for the country's agriculture.

Reducing the Cost of Production.

As important as the growing of good crops is the reduction of cost. South Australia has done more than her share in this regard for Australian agriculture. Mention has been made of the labour-saving ploughs and cultivators; composite ploughs and drills may be added to the cultural implements. In the harvesting of wheat the reaping hook has been left far behind in the agricultural dark ages. Mr. John Ridley, a South Australian farmer, was the first to devise a machine to strip Australian wheat fields. Such a machine was suggested to Mr. Ridley by a notice of a Roman invention of a similar device in Loudon's Encyclopedia of Agriculture. From this primitive machine have been evolved the up-to-date stripper, the complete harvester, and the Massey-Harris reaper-thresher.

It was only natural to expect, owing to the keenness of South Australians for anything new and calculated to assist their industry, that the last-named machine should have a trial. One was seen at the Roseworthy College. It has also been tried on other farms. It is stated that Mr. L. Franks, of Mallala, reaped 240 bags of wheat, or approximately 720 bushels, in one day with one team and one man. The heads are cut off and not stripped as with the stripper, and a swath 8 feet wide is cut as against 5 or 6 feet with the ordinary harvester. The draft is much lighter. It can reasonably be claimed that, with a few slight modifications, this machine must take one of the foremost places in reducing the price of a loaf of bread to the consumer.

Motor tractors are also engaging the attention of the South Australian farmer. Delegates were afforded an opportunity of viewing the Marshall oil tractor drawing five furrows 14 inches in width, or taking a width of 5 feet 10 inches, in a field near Adelaide.

Labour-saving cultural implements and harvesting machinery are not the only factors brought to bear in this good work. The preparation for market,

transit arrangements, and marketing engage attention. In this the Government comes to the aid of the farmer, and through the medium of a Produce Department ensures the primary producer a larger proportion of profits.

Produce Department.

The duties of this Department are to receive, prepare, freeze, ship, and market such products as sheep and lambs, fruit, butter, cheese, bacon, pork, poultry, eggs, rabbits and hares, honey, and wines, on behalf of the South Australian producers. It will also undertake the inspection of wheat upon the growers' behalf.

Sheep and Lambs.

To give some idea of its scope it is prepared to take delivery at its works, and will slaughter, weigh, grade, freeze, bag and brand lambs, at 0·4d. per lb. and mutton at 0·35d. It will also undertake the whole business upon behalf of shippers, and charge a consolidated rate of 1½d. per lb. to cover all charges from the arrival of live stock until sales are made in England. This rate is based on ½d. freight, and is subject to alteration only when freights vary. Twenty-eight days' free storage is allowed; beyond that date a charge is made. For this business the Department possesses one of the most up-to-date plants in Australasia. It has a capacity of yarding, slaughtering, and freezing 8,000 lambs per day, and of cold-storing 200,000 frozen carcases.

During the season 1910-1911, 195,436 lambs, 2,981 hoggets, and 43,117 carcases of mutton were exported through the Depôt.

Butter.

For this branch of the business an up-to-date butter factory, with a capacity of 25 tons of butter per week, treats producers' cream. The aim of the Department is to give full satisfaction by returning suppliers all the butter fat that their cream contains, and so selling the butter produced that the very highest values obtainable can be given. The Department will also take delivery of butter at its works, and will freeze to the required temperature for shipment, at a charge of 3½d. per box.

Fruit.

The charges for receiving, chilling, storing for seven days, and delivering apples, pears, and oranges to steamers alongside of the Depôt is 1½d. per case. The Department supplies cases, wood-wool, and tissue paper, for packing apples, pears, and oranges, at cost price, the amounts to be deducted from account sales.

The other produce is taken upon similar lines.

Exploiting New Markets.

In addition to providing all necessary accommodation for treatment of produce before shipment, the Government has established a Commercial Agency in London to attend to the interests of all producers who might wish to

exploit English or Continental markets with their produce. The Agent is also using every endeavour to enhance and extend the representation of South Australian produce.

Prosperity.

During the past six or seven years the seasons have been more favourable than the average. As a result farmers are prosperous. The old-fashioned spring-cart some years ago gave place to the buggy. The buggy is now giving way to the motor car. It is stated that it is common to see over twenty motor cars owned by farmers at their fairs.

The strenuous life of the pioneer is over for many of them, and they are justly reaping the reward of their self-denial and prodigious up-hill fight against many natural disadvantages which were there but to be overcome. By making good, they have benefited Australia. It is for the young farmer, backed by the experiences of his forbears, to continue the pioneering into the dry zone, and if the same success attends his efforts, Australia will have much to thank him for. That the progression and prosperity may long continue is the earnest wish of one who derived much pleasure and profit in taking a cursory glance at the conditions under which the South Australian farmer has laboured and proved successful.

NOTES FROM THE INTERSTATE CONFERENCE ON DRY FARMING, ADELAIDE, MARCH, 1911.

E. CROUCH, Wagga.

ALTHOUGH the attendance, particularly of practical farmers, was not large, this Interstate Conference to discuss agricultural matters, was a decided success, and the interest taken in the matters discussed was very keen. It has been described in the press as an historic step in the development of agriculture in Australia. With this description we agree, as there are millions of acres in Australia yet untouched by the plough which may be brought under cultivation by an advanced system of farming, having for its object the conservation of soil moisture.

Rainfall.

The delegates were afforded opportunities of visiting several of the main wheat-growing centres of South Australia, and of discussing with both experts and farmers the development of wheat-growing in that State.

There are farmers in South Australia who declare that they can grow wheat profitably with a rainfall of from 7 to 8 inches, provided the rain comes during the growing period. Professor Lowrie, President of the Conference, in his opening address, stated that he did not like the term "dry farming," as he

considered that growing wheat with a 15 to 17-inch rainfall, which in America was spoken of as dry-farming conditions, was in Australia one of the best propositions he knew.

The evidence presented to us bore out the truth of the Professor's statement. The New South Wales delegates visited a district in South Australia, 150 miles north of Adelaide, with an average rainfall of from 15 to 18 inches, and there saw evidence of great prosperity. Well-improved farming lands in this district are selling up to £11 per acre.

South Australian Cultural Methods.

The system under which the farmers work is principally bare fallow, with the free use of fertilisers; but they are very keen on working the surface, after ploughing, to a depth of 2 to 3 inches, with the object of creating a mulch to conserve soil moisture. In this respect the farmers of New South Wales are far behind those of South Australia.

Deep ploughing is not advocated, but rather condemned, as after years of experience it has not proved beneficial. About 5 inches seems to be the average depth aimed at, but on some soils not more than 3 inches.

The Campbell System.

"Dry farming" to many people means the Campbell system, but with few exceptions the papers read at the Conference did not touch upon that system.

At Hammond, 213 miles north of Adelaide, the Campbell system has been given a trial over three harvests, the sub-surface packer being used. The yield of wheat was a few bushels higher than under the ordinary system of bare fallow; but the rainfall during the three years was 20 per cent. above the average of the previous eight years.

Another test of the Campbell system has been made by the Honorable T. Pascoe in the Terowie district—one of the driest farming districts of South Australia—and the result has been fairly satisfactory. It was reported in a section of the New South Wales press that the return from the use of the packer was 40 bushels of wheat to the acre; but Mr. Pascoe himself gives the average in the best year as 19 bushels, and here again the rainfall was above the normal.

Varieties of Wheat.

The wheats favoured by South Australian farmers vary according to the districts. On the lowlands near the coast, 20 to 25 feet above sea-level, Federation is not extensively grown; the favoured wheats appear to be Gluyas, Carmichael's Eclipse, and Marshall's No. 3. But inland, well on to 2,000 feet above sea-level, Federation has a long lead. The difference may be due to the fact that rust is almost unknown inland, whilst on the coast the reverse is the case.

Take-all.

As much has been said and written concerning take-all in wheat fields, I made extensive inquiries amongst practical farmers in South Australia as to the conditions under which the disease thrives. Without exception their experience was that take-all was only noticeable in crops where the land had been worked and the wheat sown before rain. This appears to indicate that it is not wise to work the soil to any depth under dry conditions.

New South Wales farmers suffered considerable losses from take-all last year, but in South Australia its ravages were much more extensive. At one railway station alone the wheat delivered was 30,000 bags less than the previous harvest, the deficiency being due solely to take-all.

In one district in which take-all was most severe, a farmer contends that he saved his crop from the pest by travelling sheep through the crop during the growing period, and that his return was from two to three bags per acre more than that of his neighbour across the fence. Fallowing has not prevented the disease, and light soil appears to be more subject to take-all than heavy clay soil.

Growing oats as a change crop is the principal remedy advocated.

The Lessons from the Conference.

Our visit to South Australia has convinced us that no hard-and-fast rule can be laid down with regard to cultural methods for growing wheat, but that the judgment of the individual farmer must play a large part in failure or success. But in connection with working the soil to conserve moisture, under normal conditions in districts of low rainfall, you cannot work the surface of a friable soil to excess. With a soil inclined to run, however, care must be taken, as excessive working causes the surface to cement.

In the matter of selection of varieties of wheat for seed, the advice of Mr. Geo. L. Sutton deserves attention. Get your seed in small quantities, from the Government farms where possible, and then grow your own seed. You thus find out what variety of wheat suits your soil and climate.

I again repeat what I have previously written, that no test of any dry-farming system can be relied upon unless it is carried on in a year of comparative drought. Still the Agricultural Departments of the various States should go on with their experiments outside of the present wheat belt. A resolution was passed by the Conference urging them to do so.

We came back from this Conference with the conviction that to-day the man of science can do much to assist the farmer. By coupling science with sound practice, our wheat average can be raised considerably by combating the various pests of wheat and evolving a system of tillage suitable to climatic conditions. The average South Australian farmer appears to be an enthusiast, and enthusiasm often ensures success. Let the motto of the New South Wales farmer be, "For us, nothing is good enough but the best."

ADELAIDE DRY-FARMING CONFERENCE.

GEORGE LINDON, Clonegonell, Wagga.

THIS first Interstate Conference for the exchange of ideas, and to determine the bases of experiments for the purpose of getting the best results from a limited rainfall, arose from a suggestion made by the Under Secretary of Agriculture for New South Wales at the Wheat growers' Conference, held in Sydney in July last. The South Australian Department are to be commended for grasping the position, and calling the Conference together, and for the thoroughly businesslike and practical manner in which they carried it out, sparing neither trouble nor expense in their efforts to make it a success. This it undoubtedly was, there being representatives from Queensland, New South Wales, and Victoria, in addition to those of South Australia.

South Australian Methods.

In districts of limited rainfall the methods which have been found to give better results than others are—fallowing, with frequent working of the fallow before sowing; rotation of crops; use of artificial manures; and sowing suitable varieties of wheat. To South Australia belongs the credit of establishing the value of fallowing, and I believe that New South Wales farmers could benefit to some extent by imitating their southern cousins, more particularly in the matter of working their fallows and rotation of crops.

In South Australia it is no uncommon thing to find that a fallow has been gone over six or seven times before sowing, while it is a rare occurrence to see land sown twice in succession with the same crop. The usual custom is a three years' rotation—fallow, wheat, and grass; but, in some instances, fodder crops, such as rape, kale, lucerne, barley or oats, are sown in the third year for grazing. Sometimes the oats are sown early in the autumn, and grazed through the winter until the early spring, when the stock are taken off and a crop of hay or oats harvested. The land is then put under fallow the following year.

A great difference exists between the tilling operations carried out in the two States, both in regard to the implements used and the manner of working. In South Australia ploughing appears to be a secondary consideration. This explains why we seldom see South Australian farmers on arriving in this State do as good ploughing as New South Wales or Victorian farmers, who depend more upon the ploughing operations to produce their crops. The South Australian depends upon the after-working, which commences directly after the land is ploughed. It is performed with harrows, skim ploughs, and cultivators of various descriptions.

One noticeable feature is that South Australian farmers work all their horse-teams abreast, and it is not uncommon to see ten or twelve horses

yoked to a cultivator or skim plough in this manner. Some of these implements cover 10 or 12 feet, while harrows up to 30 feet are drawn by one team of horses. The horses, moreover, are generally a good stamp of Clydesdale, rather better than average New South Wales horses.

South Australian Soils.

Generally speaking the South Australian soils, and more especially the subsoils, are of a more porous nature than the soils of the Wagga district. This leads me to believe that by adopting their methods of after working we would obtain even better results for the extra labour than they do. Our subsoil being of a more retentive character, the moisture is held closer to the surface, and is more readily evaporated should favourable conditions be allowed to exist for any length of time.

Whilst I saw large tracts of good arable land, yet it was somewhat surprising to see so much inferior land put under wheat. Large areas of limestone land carry a dense growth of mallee. This land has practically no soil, except a few inches of sand, resting on a limestone rubble of particles from the size of a grain of wheat up to large rocks of several hundredweight. The large stones are gathered into heaps or rows, and are sometimes made into fences. The writer was informed that on some of this land, after the mallee scrub was rolled down and burned off, the seed was simply drilled in with a disc drill, and as much as 25 bushels per acre harvested during the past few years. But during recent years the rainfall has been above the average.

Rainfall.

Another noticeable feature is the difference in the distribution of the rainfall in the two States. Mr. Anderson, our Under Secretary, took the trouble to dissect the rainfall records for a number of what are called dry districts in South Australia, and which appear to be dry as compared with this State. Some of these districts have an average of only 15 or 16 inches per annum, but it was found that 12 or 13 inches of the total fell during the growing period. In our districts of 19 or 20 inches rainfall, the amount received during the growing period rarely exceeds 10 inches.

Result of the Conference.

The last business transacted was perhaps the most important question of all—the direction in which further experiments should be carried out. After hearing all the arguments, it was decided that experiments should be conducted in each State, testing the Campbell system against other known methods, and acting in uniformity, so that each State might benefit the others as well as itself.

Field Experiments with Wheat.

GEO. L. SUTTON, late Wheat Experimentalist.

II.—THICK AND THIN SEEDING TRIALS.

Object.—To determine the most seasonable time to plant the crop, and the most suitable amounts of seed to use at different periods of the planting season:—

(*a*) For the production of hay, and
(*b*) For the production of grain.

This experiment is divided into three sections, one of which is sown in the beginning, the second in the middle, and the third at the end of the planting season.

The early planted section is fed-off at a suitable time, because, for the present, this is considered to be the best treatment for an early sown crop.

In order to obtain results that are not likely to be affected by peculiarities of the variety, this experiment is carried out with at least two varieties, as far as possible, one a free, the other a scanty stooler. The varieties used are those which have proved suitable for the district in which the experiment is planted. Each section of the experiment requires three plots for each variety. These plots are seeded at rates which, for the district, are considered respectively thin, medium, and thick sowings.

THICK AND THIN SEEDING TRIALS WITH WHEAT, COWRA EXPERIMENT FARM, 1910.

F. DITZELL, Experimentalist.

THIS experiment has been carried out in accordance with the general directions governing it at this and the other Experiment Farms.

The rotation adopted in connection with this experiment is a two course one, in which wheat alternates with a fodder crop. Two blocks are therefore required. Those reserved are F I and II, and D I.

This year blocks F I and II were occupied. Prior to the commencement of the experiment these blocks had been cropped and manured in a uniform manner, so that the land was in an even and suitable condition for the planting of this experiment. The land was cleared and broken up in 1906, and from then until the planting of the experiment it had been cropped as follows:—

1906	Wheat without fertiliser.
1907	Black tares (or vetches), to which a mixed fertiliser, composed of superphosphate 4 parts, and sulphate of potash 1 part, was applied at the rate of 54 lb. per acre.
1908	Wheat without fertiliser.
1909	Black tares (or vetches), to which a mixed fertiliser, composed of superphosphate 4 parts, and sulphate of potash 1 part, was applied at the rate of 64 lb. per acre.

Preparation of the Ground.

The preceding fodder crop of tares having been fed-off with sheep over the whole of the block, the land was disc cultivated in January. In February it was disc ploughed 5 inches deep and then harrowed. The land was then disc cultivated and harrowed when necessary until planting time, to maintain a loose mulch of dry earth about 3 inches deep, and to destroy all weed growth.

Planting.

The different sections, or plantings, were arranged as per Sketch A, and preparations were made to plant each as follows :—

(1) Early planting, fed-off, was to be planted from 23rd March to 7th April.
(2) Midseason planting was to be sown from 1st May to 14th May.
(3) Late planting was to be sown from 7th June to 20th June.

In each case a margin of fourteen days had been allowed, to afford that elasticity which is always necessary when plans for agricultural operations are being made. In every instance this programme was adhered to.

The plots were 14·5 links wide, to accommodate the width of the drill.

Two varieties were sown, namely—

Federation, an early variety ; and
John Brown, a midseason variety.

Both these wheats may be called good stoolers.

Sketch B, of one section or planting, shows the manner in which the plots were arranged in the carrying out of this experiment. The divisions shown on this sketch, and which were planted with John Brown wheat, were cut out early for hay, to furnish tracks for the harvesting of the experiment.

To prevent the occurrence of bunt (smut) in the ensuing crop, the seed was treated with a solution of bluestone (2 per cent.) and salt (2 per cent.).

The rates of seeding were about as follow :—

Thin seeding—22 lb. per acre.
Medium seeding—36 lb. per acre.
Thick seeding —57 lb. per acre.

No fertiliser was used.

After planting, the land was harrowed to thoroughly cover the seed and to prevent the soil from drying out unduly. Whenever necessary to destroy a crust after rain, the growing crop was subsequently harrowed.

Feeding-off.

The early-planted section was fed-off rapidly and completely with sheep over the whole of the block on 28th, 29th, and 30th May, and was then harrowed.

Harvesting.

Before harvesting, the transverse division, which is shown on Sketch A, was cut out for hay, and the plots were then reduced to 1-20th of an acre in area by cutting off the ends and the outside drills of the plots, thus eliminating outside influences. One plot each for hay and for grain were

harvested, and from these areas harvested the computed yields per acre have been worked out. For publication the odd lb. in the hay yields have been discarded.

The plots required for hay were harvested with a reaper and binder when in full flower, and immediately weighed to ascertain the green weights, from which the computed yields of greenstuff per acre have been worked out. The produce of each plot was then stooked on that plot, and was reweighed when thoroughly dry, this giving the hay weight from which the yields per acre have been computed.

The remaining plots left for grain were harvested with the reaper and binder when the straw under the ear had turned yellow, were immediately tooked on their respective plots, carefully labelled, and the sheaves tied together to prevent disturbance by the wind. The grain was threshed directly from the stooks, and then weighed as soon as possible after it had matured. The weights recorded are therefore those of a farmer's sample. From these weights the yields per acre have been computed.

The Character of the Season.

Particulars of the rainfall for the year and conditions at seeding times are given in June *Gazette*, page 484.

Results.

The results are given in the tables that follow. As these results are from one year's experiments only, it is impossible to draw any definite conclusions from them, and the following deductions must be regarded as being strictly tentative only.

As the plots for hay were weighed immediately after harvesting, it is possible to give the computed yields of greenstuff per acre. These should be of value to anyone contemplating the making of silage from wheat, such as is successfully practised at this farm.

Tables I, II, and III show the computed yields per acre, and also the percentage yields, from the various plots harvested for greenstuff and hay, and grain respectively.

The percentage yields enable comparisons to be made more easily than from the computed yields per acre. As a basis for the working out of these percentages for each variety, the midseason medium-seeded sowing of each variety has been taken to represent 100 per cent.

These tables also show the variations due to planting at different times. The different times of planting may be arranged in order of merit as follows:—

For Hay.

John Brown.			Federation.		
Thin.	*Medium.*	*Thick.*	*Thin.*	*Medium.*	*Thick.*
Early—Fed-off Midseason. Late.	Early—Fed-off Midseason. Late.	Midseason. Early -Fed-off Late.	Early—Fed-off Midseason. Late.	Early—Fed-off Late. Midseason.	Early—Fed-off Midseason. Late.

FOR GRAIN.

John Brown.			Federation.		
Thin.	*Medium.*	*Thick.*	*Thin.*	*Medium.*	*Thick.*
Midseason. Late. Early—Fed-off	Midseason. Early—Fed-off Late.	Midseason. Early—Fed-off Late.	Midseason. Early—Fed-off Late.	Early—Fed-off Midseason. Late.	Early—Fed-off Midseason. Late.

It will be seen from the above that, with these two varieties, the earlier plantings generally give the greatest yield of hay.

In the grain yields it will be noticed that the midseason planting has generally given a better yield than the early planting.

The frosts on 8th, 9th, 10th, and 13th October affected the early planting of the John Brown slightly, which accounts for the fact that with this variety the midseason planting has beaten the early planting in every case.

Another reason why the early planting should not give the highest yield was that its germination was very patchy, as is explained under the character of the season in June *Gazette,* although this did not prevent it from giving the highest yields of hay.

As expected, since John Brown is only a midseason wheat, and therefore not suitable for late planting, and Federation is just included in the early wheats, and is, therefore, not very suitable for late planting, the late plantings generally gave the lowest yields.

Tables IV and V show more clearly than do Tables II and III the variations in the yield of hay and grain due to the quantity of seed sown per acre.

Arranged in order of merit, the most suitable quantities of seed to sow per acre for the different plantings are as follows :—

FOR HAY.

John Brown.			Federation.		
Early—Fed-off.	*Midseason.*	*Late.*	*Early—Fed-off.*	*Midseason.*	*Late.*
Medium. Thick. Thin.	Thick. Medium. Thin.	Thick. Medium. Thin	Thick. Thin. Medium.	Thick. Thin. Medium.	* { Thick. { Medium. Thin.

* Equal.

FOR GRAIN.

John Brown.			Federation.		
Early—Fed-off.	*Midseason.*	*Late.*	*Early—Fed-off.*	*Midseason.*	*Late.*
Medium. Thick. Thin.	Medium. Thick. Thin.	Thin. Medium. Thick.	Thick. Medium. Thin.	Thick. Thin. Medium.	Thick. Medium. Thin.

The thicker sowings have thus generally given better results, both for hay and for grain, than the thin sowings.

As the results are in many instances contradictory and not in accordance with what was expected, they only serve to illustrate more forcibly the necessity for the carrying out of the same experiment over a series of years before definite results can be obtained.

Experiment II.—Thick and Thin Seeding Trials with Wheat, Cowra Experiment Farm, 1910.

A. *General Sketch.*

(a) For grain.		(b) For hay.
Buffer.	Transverse division, cut out for hay before harvesting.	*Buffer.*
Early Planting, Fed-off. Plots 1 to 8.		Early Planting, Fed-off. Plots 1 to 8.
Midseason Planting. Plots 1 to 8.		Midseason Planting. Plots 1 to 8.
Late Planting. Plots 1 to 8.		Late Planting. Plots 1 to 8.

Approximate area occupied by experiment, 3½ acres.

B. *Detailed Sketch of each Planting.*

(a) For grain.		(b) For hay.
1. John Brown... ... *Thin.*	Transverse division, cut out for hay before harvesting.	1. John Brown... ... *Thin.*
2. John Brown... ... *Medium.*		2. John Brown... ... *Medium.*
3. John Brown... ... *Thick.*		3. John Brown... ... *Thick.*
4. John Brown... ... Division.		4. John Brown... ... Division.
5. Federation ... ... *Thin.*		5. Federation ... ... *Thin.*
6. Federation ... ... *Medium.*		6. Federation ... ... *Medium.*
7. Federation ... ... *Thick.*		7. Federation ... ... *Thick.*
8. John Brown... ... Division.		8. John Brown... ... Division.

Approximate area of each plot, $\frac{1}{13}$ acre.

TABLE I.

Showing the computed yields of greenstuff per acre.

Section.	Date Planted.	John Brown. Date Harvested.	John Brown. Thin. Computed Yield.	John Brown. Thin. Percentage Yield.	John Brown. Medium. Computed Yield.	John Brown. Medium. Percentage Yield.	John Brown. Thick. Computed Yield.	John Brown. Thick. Percentage Yield.	Federation. Date Harvested.	Federation. Thin. Computed Yield.	Federation. Thin. Percentage Yield.	Federation. Medium. Computed Yield.	Federation. Medium. Percentage Yield.	Federation. Thick. Computed Yield.	Federation. Thick. Percentage Yield.
			t. c. q.		t. c. q.		t. c. q.			t. c. q.		t c. q.		t. c. q.	
Early-Fed-off	1 April ...	20 October .	4 19 3	87	5 13 3	100	5 14 2	100	20 October ..	5 13 0	121	5 7 3	115	5 13 1	121
Midseason ...	9 May ...	26 October...	4 11 1	80	5 14 1	100	6 10 0	114	26 ,, ...	4 15 1	102	4 13 3	100	5 2 1	109
Late	9 June ...	7 November	4 16 2	84	5 1 2	89	5 6 1	93	7 November	5 2 1	109	5 12 1	120	5 12 0	120
Average ...	...	...	4 15 3	84	5 10 0	96	5 17 0	102	.. ...	5 3 2	110	5 4 3	112	5 9 1	116

TABLE II.

Showing the computed yields of hay per acre

Section.	Date Planted.	John Brown. Date Harvested.	John Brown. Thin. Computed Yield.	John Brown. Thin. Percentage Yield.	John Brown. Medium. Computed Yield.	John Brown. Medium. Percentage Yield.	John Brown. Thick. Computed Yield.	John Brown. Thick. Percentage Yield.	Federation. Date Harvested	Federation. Thin Computed. Yield.	Federation. Thin Percentage Yield.	Federation. Medium. Computed Yield.	Federation. Medium. Percentage Yield.	Federation. Thick. Computed Yield.	Federation. Thick. Percentage Yield.
			t. c. q.		t. c. q.		t. c. q.			t. c. q.		t. c. q.		t. c. q.	
Early-Fed-off	1 April	20 October . .	1 19 3	88	2 12 2	116	2 6 0	102	20 October ..	2 18 3	140	2 13 2	129	2 18 2	141
Midseason ...	9 May ..	26 ,, ..	1 16 0	80	2 5 1	100	2 14 0	119	26 ,, ...	2 2 3	103	2 1 2	100	2 4 3	108
Late	9 June ...	7 November	1 16 0	79	1 18 3	85	1 19 3	88	7 November	1 18 3	94	2 3 1	104	2 3 1	104
Average ...	...	...	1 17 1	82	2 5 2	100	2 6 3	103	......	2 6 3	113	2 6 0	111	2 8 3	118

TABLE III.

Showing the computed yields of grain per acre.

Section.	Date Planted.	John Brown. Date Harvested.	John Brown. Thin. Computed Yield.	John Brown. Thin. Percentage Yield.	John Brown. Medium. Computed Yield.	John Brown. Medium. Percentage Yield.	John Brown. Thick. Computed Yield	John Brown. Thick. Percentage Yield.	Federation. Date Harvested.	Federation. Thin. Computed Yield.	Federation. Thin. Percentage Yield.	Federation. Medium. Computed Yield	Federation. Medium. Percentage Yield	Federation. Thick. Computed Yield	Federation. Thick. Percentage Yield
			bus.		bus.		bus.			bus.		bus.		bus.	
Early-Fed-off	1 April ..	21 November	16·0	61	25 3	97	23·2	89	21 November	25 5	98	28 8	111	29 3	113
Midseason ...	9 May	28 ,,	20·3	77	26·2	100	24 0	92	28 ,,	26 3	101	26 0	100	26 6	102
Late	9 June .	28 ,,	18·5	71	17·8	68	16·2	62	28 ,,	15 6	60	17·3	67	20·3	78
Average	.. ...	.	18·3	70	23·1	88	21·1	81	.	22·5	87	24·0	92	25·4	98

TABLE IV.

Showing the variations in the yields of hay due to the quantity of seed sown per acre.

Quantity of Seed sown per Acre.	Early Planting—Fed-off. *John Brown.* Computed Yield.	*John Brown.* Percentage Yield	*Federation.* Computed Yield	*Federation.* Percentage Yield.	Midseason Planting. *John Brown.* Computed Yield	*John Brown.* Percentage Yield	*Federation.* Computed Yield	*Federation.* Percentage Yield.	Late Planting. *John Brown.* Computed Yield	*John Brown.* Percentage Yield	*Federation.* Computed Yield	*Federation.* Percentage Yield
	t. c. q.		t. c. q.		t. c. q.		t. c. q.		t. c. q.		t. c. q.	
22 lb. = Thin	1 19 3	88	2 18 3	140	1 16 0	80	2 2 3	103	1 16 0	79	1 18 3	94
36 lb. = Medium	2 12 2	116	2 13 2	129	2 5 1	100	2 1 2	100	1 18 3	85	2 3 1	104
57 lb. = Thick	2 6 0	102	2 18 2	141	2 14 0	119	2 4 3	108	1 19 3	88	2 3 1	104

TABLE V.

Showing the variations in the yields of grain due to the quantity seed sown per acre.

Quantity of Seed sown per Acre.	Early Planting—Fed-off.				Midseason Planting.				Late Planting.			
	John Brown.		*Federation.*		*John Brown.*		*Federation.*		*John Brown.*		*Federation.*	
	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.	Computed Yield.	Percentage Yield.
	bus.		bus.		bus.		bus		bus.		bus.	
22 lb. = Thin	16·0	61	25·5	98	20·3	77	26·3	101	18·5	71	15·6	60
36 lb. = Medium	25·3	97	28·8	111	26·2	100	26·0	100	17·8	68	17·3	67
57 lb. = Thick	23·2	89	29·3	113	24·0	92	26·6	102	16·2	62	20·3	78

THICK AND THIN SEEDING TRIALS WITH WHEAT, WAGGA EXPERIMENT FARM, 1910.

R. W. McDIARMID, Experimentalist.

MIDSEASON and late plantings only were made, it being too late to make any early sowing when the experiment was started.

The following varieties were chosen, and amounts of seed per acre sown:—

Bunyip (early variety), 30, 45, and 60 lb.
Zealand (late variety), 30, 45, and 60 lb.

Wheat Experiment Plots, Wagga Experiment Farm.

Plots were harvested for hay and grain in both seasons of planting, and the results obtained are given in the table. This shows that Bunyip yielded more hay and grain in the late planting, but an allowance must be made for the better germination in the late section than in the midseason-planted section. This better germination was no doubt due to the better seed-bed at planting time in the late planted section. The difference was more noticeable in the case of Bunyip than of Zealand.

Zealand has yielded better in the midseason plantings than in the late plantings.

With both varieties the growth was taller and the plants stooled better in the midseason section than in the late section.

TABLE showing Results of Thick and Thin Seeding Trials with Wheat, Wagga Experiment Farm, 1910.

Midseason planting—12th May, 1910.
Area harvested = ·13034 acre.

Late planting—15th June, 1910.
Area harvested = ·04284 acre.

Plot	Variety.	Seed per acre.	Midseason Planting.							Late Planting						
			Hay.					Grain.		Hay.					Grain.	
			Date.			Yield.		Yield.		Date.			Yield.		Yield.	
			Flowered.	Harvested.	Weighed.	Plot.	Computed per Acre.	Plot.	Computed per Acre.	Flowered.	Harvested.	Weighed.	Plot.	Computed per Acre.	Plot.	Computed per Acre.
		lb.	1910.	1910.	1910.	c. q. lb.	t. c q. lb.	c. q. lb.	b. lb.	1910.	1910.	1910.	c. q. lb.	t. c. q. lb.	lb.	b. lb.
1	Bunyip ...	30	26 Sept.	13 Oct.	27 Oct.	2 3 25	1 2 3 7	1 2 13	23 9	14 Oct.	25 Oct.	16 Nov.	1 1 14	1 12 0 11	72	27 14
2	,, ...	45	26 ,,	13 ,,	27 ,,	3 3 2	1 8 3 18	1 3 13	26 43	14 ,,	25 ,,	16 ,,	1 1 16	1 12 2 1	69	26 4
3	,, ...	60	26 ,,	13 ,,	27 ,,	4 0 2	1 10 3 9	1 3 2	25 19	14 ,,	25 ,,	16 ,,	1 2 16	1 18 1 11	72	27 14
4	Zealand ...	30	31 Oct.	15 Nov.	9 Dec.	7 1 23	2 17 0 22	1 2 4	22 0	5 Nov.	16 Nov.	6 Dec.	2 0 4	2 7 2 2	52	20 14
5	,, ...	45	31 ,,	15 ,,	9 ,,	6 3 8	2 12 1 10	1 2 4	22 0	5 ,,	16 ,,	6 ,,	1 3 7	2 2 1 7	53	20 37
6	,, ...	60	31 ,,	15 ,,	9 ,,	7 1 5	2 15 3 24	1 2 21	24 10	5 ,,	16 ,,	6 ,,	1 3 1	2 1 0 6	59	21 57

The plots of Zealand sown at 30 and 45 lb. per acre produced better hay than the plot sown at the rate of 60 lb. seed per acre. The heavy sowing produced a very flaggy crop, and the colour of the hay was impaired by the excessive amount of dead flag at the bottom of the plants.

In the case of Bunyip, this year's experiments indicate that better results are obtained from the thicker seedings.

Wheat in Stooks, Experiment Plots, Wagga Experiment Farm.

THICK AND THIN SEEDING TRIALS WITH WHEAT, BATHURST EXPERIMENT FARM, 1910.

R. G. DOWNING, Acting Experimentalist.

It was originally intended that this experiment should consist of three plantings, viz., early, midseason, and late, but as this arrangement could not be carried out, midseason and late plantings only were made.

Two varieties were experimented with, viz., an early variety, Bunyip, and a late one, Cleveland. Bunyip is also a scanty stooler and Cleveland a free stooler.

Seedings were made at three rates, viz., thin, 20 lb. per acre; medium, 30 lb. per acre; and thick, 40 lb. per acre. Separate plots were sown of each variety for hay and for grain at each of the three rates per acre.

Just previous to harvesting, the area of each plot was reduced to $\frac{1}{16}$ acre.

The whole of the experiment was manured with superphosphate, the drill being set to sow 30 lb. per acre.

The following table shows the results for hay and for grain of the two plantings of the experiment:—

Variety.	Rate of Seeding.	Midseason Planting.				Late Planting.			
		For Hay.		*For Grain.*		*For Hay.*		*For Grain*	
		Plot Yield.	Acre Yield.	Plot Yield.	Acre Yield.	Plot Yield.	Acre Yield.	Plot Yield.	Acre Yield.
		lb.	t. c. qr. lb.	lb.	bus.	lb.	t. c. qr. lb.	lb.	bus.
Cleveland .	Thin, 20 lb. ...	138	0 19 2 24	73	19·5	136	0 19 1 20	88	23·46
do ...	Medium, 30 lb. ...	147	1 1 0 8	81	21·6	159	1 2 2 24	91	24·26
do ...	Thick, 40 lb. ...	182·7	1 6 0 21	100	26·6	162	1 3 0 16	91	24·26
Bunyip ...	Thin, 20 lb. ...	104	0 14 3 12	60	16·0	100·25	0 14 1 8	59	15·73
do ...	Medium, 30 lb. ...	130	0 18 2 8	72	19·2	114·0	0 16 1 4	60	16·0
do ...	Thick, 40 lb. ...	159·5	1 2 3 5	78	20·8	115 0	0 16 1 20	60	16·0

INSECTIVOROUS BIRDS.

DESCRIPTION OF A NEW SUB-SPECIES OF *Dacelo gigas* ("LAUGHING KINGFISHER," OR "LAUGHING JACKASS").

ALFRED J. NORTH, C.M.Z.S., Ornithologist to the Australian Museum.

DACELO McLENNANI, *Sub-sp. nov.*

Adult female.—Like the adult female of *Dacelo gigas*, but smaller, richer, and darker in colour on the upper parts; the feathers on the forehead, except those at the extreme base—which are dull brownish-white with dusky centres—rufous with blackish centres, as are also those on the crown of the head and centre of the nape, the blackish hue being more spread over the feathers of the latter and almost entirely occupying some of the lengthened crest plumes; it is more rufous on the ear coverts, the quills and upper wing-coverts are nearly black, and the silvery-blue tips to most of the latter more pronounced; the scapulars and back are darker, and the upper tail-coverts and tail feathers of a richer rufous, but similarly marked with black. "Upper mandible brownish-black, lower mandible dirty-white; iris, brown" (McLennan). Total length, 15·75 inches; wing, 7·5; tail, 5·5; bill, 2; tarsus, 1.

Habitat.—Cape York Peninsula, Northern Queensland.

Type.—In Macgillivray Collection.

Remarks.—I have much pleasure in associating with this new sub-species the name of its discoverer, Mr. William McLennan, who has with commendable energy been collecting for the past fifteen months in Northern Queensland on behalf of Dr. W. Macgillivray, of Broken Hill, New South Wales. Apparently, this specimen is barely through the moult, for some of the quills and tail feathers are not fully grown. McLennan's Kingfisher bears the same relation to *Dacelo gigas* as does the Fawn-breasted Kingfisher to *D. leachii.* Its stomach contained grasshoppers, beetles, and small bones.

Rhodes Grass, grown without irrigation at Pera Bore.

This is the grass which North Coast dairymen say they prefer to *Paspalum*. Its behaviour at Pera, where the annual rainfall is 10 inches, and the summer temperature somewhere between 100° F. and boiling-point, indicates what a valuable addition it is to our list of cultivated grasses.

Lucerne, grown with irrigation at Pera Bore.

FODDERS FOR THE FAR WEST.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"CATERPILLAR EATER."

Insectivorous Birds of New South Wales.

[Continued from page 504.]

19. Caterpillar Eater.

THE bird now illustrated is the most commonly seen species of Caterpillar Eater. The Pied and Jardine's are met with frequently enough on the North Coast, but this one, the white-shouldered species, may be found during the spring and summer months throughout the State.

It is a strictly migratory bird in New South Wales. The birds arrive in the neighbourhood of Sydney early in September, remain to breed, and depart with their young in February. They pass the winter in northern Queensland or the Northern Territory, but they return regularly to the same breeding-grounds year after year.

The male bird usually builds the nest. Mr. North watched the complete operation at Chatswood, and never saw the female at all. After the eggs are laid, the male generally sits on them during the day, being relieved by the female at night. The nest is built of fine roots or grasses, sometimes in an upright fork of a tree, but more often in a slightly leaning branch and towards the end of a limb. It is a shallow, flimsy structure, not easily seen except when the bird is sitting, and one would expect to see the eggs roll out when the branch sways in the wind. Two, or sometimes three, eggs are laid, light green with streaks of reddish-brown.

Total length of bird in the flesh, 7 inches. These illustrations are all half natural size. The male bears some resemblance to the Black and White Robin, but his song is somewhat like that of the Jacky Winter, though louder and deeper.

The food of the Caterpillar Eater "consists entirely of insects and their larvæ, obtained chiefly among the leaves of trees, and sometimes on the ground."—(NORTH). It frequents orchards, but it has never been recorded as attacking fruit. It is, in fact, seeking the insects which are the orchardist's most deadly enemies, and every encouragement should be given to it. Our orchardists have many enemies amongst the introduced bird life of the State; the object of this little series is to assist them in knowing their native Australian friends.

20. Yellow-breasted Thickhead.

This pretty black, white, and yellow bird is not such a traveller as the one last described, but may be met with all the year round in the coastal and mountain districts of the State. The male bird does not develop the beautiful white throat, black collar and head, and yellow breast until he reaches maturity; in fact Mr. Hall mentions three distinct stages of plumage—(*a*) rufous, (*b*) grey, and (*c*) yellow, white and grey. This development of colouring has puzzled ornithologists as to the exact number of species of

Pachycephala found in Australia; but the farmer will not worry about such a question. The following paragraph, quoted by Mr. Hall, from one of Gould's famous volumes, is more to our purpose:—

The *Pachycephala gutturalis* may be regarded as the type of this genus, the members of which are peculiar to Australia and the adjacent islands to the northward. Their habits differ from those of most other insectivorous birds, particu'arly in their quiet mode of hopping about and traversing the branches of the tree in search of insects and their larvæ. Caterpillars constitute a great portion of their food.

The Thickhead is a scrub bird, living and nesting in the coastal brushes, but it is perhaps more plentiful in the humid mountain ranges and in the damp gullies of the coastal spurs. It extends inland as far as the western slopes of the Blue Mountains. It has a clear cheerful note, like the words "seed wheat," repeated several times with the accent on "wheat," and frequently uttered immediately after a peal of thunder or the report of a gun.

The nest is cup-shaped, built of leaves, rootlets, fern-fronds or other available material, and placed in the upright fork of a bush or low tree, generally only from 5 to 12 feet above the ground. The eggs are usually two, creamy white, dotted with brown. August and the four following months constitute the usual breeding season.

This is another of the farmer's outposts, quietly working away in the scrubs. We are often inclined to boast that Australia has no pests, except those which have been thoughtlessly introduced, but we must not forget that many of our native insects have all the qualities which make for trouble if they are allowed to become sufficiently numerous. That they have been kept down is due to the great many species of native insectivorous birds which we possess, and these will, if preserved, often render unknown assistance by preventing the spread of undesirable immigrants. Let us add the pretty Thickhead to the list of those birds which are able and willing to help us, and which ask no return except to be allowed to live and breed and beautify the bush.

The Rufous-breasted Thickhead is perhaps even more common in the orchards and gardens of New South Wales.

Grubs and Weevils in Stored Wheat.

"D.W." asks if there is any known simple process for preventing the development of the eggs of grubs and weevils in wheat, or if hatched, how to kill them. Mr. W. W. Froggatt, Government Entomologist, reports:—

It is difficult to prevent the development of grain weevil in infested grain. These beetles may remain for a long time in the immature state in the maize or wheat if the temperature is low, warmth and damp developing them much sooner.

Bisulphide of carbon is the only chemical that we can find to kill grain weevil; 1 lb. will kill all the weevils in 100 bushels of grain. The grain is heaped up, a jar being placed on the floor in the centre, and into this jar a pipe is placed so that when the heap is ready the bisulphide can be poured down the pipe. The fluid thus runs into the jar, and the fumes spread out under the wheat or other grain that is being treated. The pipe is withdrawn, and a tarpaulin or sheet thrown over the heap. The grain is left for twenty-four hours, when it can be opened out and bagged.

No lights should be used near bisulphide of carbon, as it is very inflammable.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"THICKHEAD."

Pachycephala gutturalis, Latham.

Standards for Preserved Milk.

On 14th, 16th, and 17th March last, a Conference of Condensed Milk Manufacturers was held at the Dairy Branch of the Department of Agriculture for the purpose of considering how proposed legislation in regard to standards for preserved milks would affect the industry. Mr. M. A. O'Callaghan, Chief of the Dairy Branch, acted as Chairman. The manufacturers had objected to the standards proposed by the Conference of Interstate officials held in Sydney in June, 1910, and at this Conference the technicalities of manufacture were discussed.

It was pointed out at the Conference that in the manufacture of unsweetened condensed milk in warm climates (where the percentage of acid in the milk develops very rapidly) it is not possible to manufacture or condense the milk to the same degree of density as is practicable in temperate climates. On this account the standard for total solids has to be lower than might be considered advisable in European countries such as Norway, Switzerland, and the British Islands. The valuable investigation work done at Purdue University, U.S.A., afforded sufficient evidence of this.

Again, in certain months of the year the percentage of butter-fat in the milk as received from the cow falls considerably below that of the balance of the year; so that the Conference was placed in the position of having to choose between a standard so low that it could be met all the year round, and one so high that whilst it would be reached during the bulk of the year, it might be necessary to add cream to the milk in certain months.

The delegates were unanimously of opinion that standards should be fixed for "total solids" and for "fat," in preference to standards for "solids not fat" and "fat." The following were the standards recommended:—

Article.	Total Solids.	Fat.
	Per cent.	Per cent.
Unsweetened Condensed Milk	28	8·5
Sweetened Condensed Milk	31	9
Concentrated Milk	37	10

With regard to unsweetened condensed milk, the standard suggested for total solids is higher than the manufacturers right through the United States are able to maintain. If in later years, after further experience of manufacture in the warmer parts of Australia, it is found that the standard is too high, the delegates pointed out that the matter should be re-opened.

The fat standard may require the addition of a little cream to the milk during one month of the year, but the delegates considered this preferable to permitting the abstraction of cream from the original milk by lowering the standard.

The standards suggested for sweetened condensed milk are the same as those used by the Commonwealth Government in connection with the export of sweetened condensed milk from Australia. In this climate only the morning's milk can be condensed, the result of which is that the milk delivered to the manufacturers contains about 1 per cent. less solid matter than in England, where the standard is 35 per cent. for total solids.

Concentrated milk is only heated to pasteurising temperatures, and can be concentrated to a much higher degree than condensed milk without coagulating the nitrogenous matter. The concentrated milk usually sold for consumption in Australia contains a much higher percentage of solids than that recommended, but this milk is largely used for shipping, and has to be re-pasteurised after tinning, so that it may keep better; consequently, it is not advisable to concentrate it to the same degree as may be done for the local trade. One delegate pointed out that even the P. and O. Company use this milk, in preference to all European makes, for their ships trading between England and Australia.

With regard to preservatives in concentrated milk, there is no uniformity in the Commonwealth and State laws. It was claimed that it is impossible to manufacture concentrated milk suitable for trade requirements in warm districts without the addition of a preservative, as experiments made by the manufacturers showed that it would not keep. The Conference recommended that ·5 per cent. of boric acid be allowed in the finished product. The delegates were discussing this matter from a manufacturer's standpoint, not from a health point of view.

The following is an extract from the report made by Mr. O'Callaghan after the Conference:—

Boric Acid *versus* High Temperatures.

Concentrated milk is not heated to a temperature sufficiently high to render it absolutely sterile, while unsweetened condensed milk is. It might now be asked why is not concentrated milk heated also to the temperature necessary to destroy all fermentations? The reply to this is that it is not possible to do so under the present trade methods. Concentrated milk, put up in large tins of 1 gallon or thereabouts, cannot be heated to a high temperature without coagulating the proteid matter; it is seen, therefore, that there is a manufacturing difficulty to be faced right away. In cold climates it is possible to make a concentrated milk which will keep while in a cold store, and which is suitable for shipping purposes, without the addition of any preservative. In Australia, however, we are dealing with semi-tropical conditions, and, so far, it has not been shown that it is possible to make a concentrated milk of the character which is demanded by the trade without the aid of a preservative such as boric acid.

Evidence put in by the delegates at the Conference clearly shows that unless boric acid, or some such preservative is used, the milk goes bad soon after it is taken out of cold store, and thus the purpose for which it is made would be defeated.

When a fleet like that owned by the P. and O. Company trading to Australia use concentrated milk, to which a limited percentage of boric acid has been added, there must be considerable evidence of its utility, otherwise such a large firm would surely procure their supplies from European manufacturers.

The advantages claimed for concentrated milk are: First, that the milk has not been heated to a temperature so high as to cause it to be difficult to digest; and, second, that

it will remain sound and good for several days after it has been opened, or, in other words, until there is time to use up all the milk contained in the tin. We know that sweetened condensed milk complies with both those conditions, but in sweetened condensed milk we have something altogether of a different composition to natural milk; in fact it is more of a condiment than a milk, and at the departmental inquiry which was held in England on the subject some years ago, one of the members of the Commission desired to recommend that sugar be not allowed in the manufacture of this product, or, if allowed, it should be clearly shown on the label.

Owing to the quantity of sugar which is added to sweetened condensed milk, the water necessary to bring it down to the consistency generally used, means that about twelve to fourteen parts of water have to be added to one of milk, and needless to say as the milk was never concentrated to more than one-third of its original bulk, the diluted product would contain a very small portion indeed of the original constituents of milk. For this reason there is a great deal to be said in favour of milk which is suitable for all purposes if it can be made without the addition of sugar. This is the reason that an unsweetened condensed milk has been placed before the consuming public, but this latter product has undoubtedly distinct drawbacks from one point of view, namely, the change which is brought about in the character of the constituents of the original milk by the action of temperatures approaching 250 degrees Fah.

It has been clearly shown that when milk from which a certain quantity of water has been evaporated is heated to anything like this temperature it loses the original characteristics of normal milk, the casein being so acted on that it is partly coagulated and rendered much more difficult to digest. We are therefore faced with the following proposition:—

Which is it better to use, a milk to which a small percentage of boric acid has been added, and which is heated to a temperature of, say, never more than 180 degrees Fah., or to use a condensed milk which has been heated to, say, 245 degrees Fah., but which contains no preservative?

The question for medical men and physiologists to decide is whether the milk to which the extreme heat has been applied is as wholesome and suitable for human food, or more so, than a milk to which a lower heat has been applied, but to which a small percentage of boric acid has been added. In consideration of this point, it must be borne in mind that if half-a-pound of boric acid is allowed in every one hundred pounds of concentrated milk, the percentage of boric acid which will be present in the same when diluted will be about ·16 per cent.

Until this question is fully answered it will be a difficult matter to decide whether boric acid should be allowed in the manufacture of concentrated milk, or otherwise; and after this point has been settled there is another which must have serious consideration, namely:—Which of the two milks will be likely to be free from fermentation or decomposition which may injuriously affect human beings, say a couple of days after the tin in which the milk has been kept was opened? On this latter point some work has been done by Dr. Tidswell, Director of the Bureau of Microbiology, and in his Annual Report for 1910 he states that "no form of condensed milk can be entirely relied upon for long after it has been unsealed and exposed to the air in the houses of ordinary consumers, and a milk which had been pasteurised and evaporated *in vacuo* to one-fourth of its original bulk, and allowed to remain in open vessels, contained, after it was two days old, 2,304,000,000 germs per cc." This goes to show that the manufacture of a concentrated milk to which no preservative has been added would be useless for trade purposes if exposed in the way these samples were for a couple of days after they had been manufactured.

Removing Fruit-trees.

"H.A.S.," Upper Orara, wished to remove three plum-trees, about two or three years old, 8 to 10 feet high, the main trunk being 2 or 3 inches through, and asked for advice as to pruning. He also wished to plant out two seedling oranges, for budding or grafting.

Mr. W. J. Allen, Fruit Expert, recommended that the plum-trees be cut hard back, say, about 4 feet of the wood. The citrus trees should not be cut so severely.

Any reader wishing to remove similar trees will find July a good month for the work.

Potato-growing at Mount Irvine.

C. P. SCRIVENER AND H. B. MORLEY.

WE attribute the success which we have obtained in growing potatoes at Mount Irvine largely to the fact that we have not gone on hard-and-fast lines, but have studied the crop and the climate of the district, modifying our methods as we found would give best results. This principle should be borne in mind in reading the following notes, as it is only in this way that a farmer can hope to make the best use of his conditions. At the same time, a great deal of our practice will apply to the cultivation of the potato in any district.

For example, we grow two distinct varieties, one with a longer season than the other; and we are quite safe in advising any farmer to do the same. There is no potato district in New South Wales where one can rely absolutely upon getting rain exactly at the right time. Should one crop miss the rain, there is generally a good chance of the other hitting it.

Again, potatoes should never follow potatoes in the same ground. We prefer to let them follow peas, clover, or any other leguminous crop; and we find that a three years' rotation answers well.

The land used for this crop should be the best obtainable, and it should be well drained, and contain plenty of decayed vegetable matter.

The ground should be ploughed at least a month before sowing time, and, if possible, a longer period between ploughing and planting will be found profitable. Plough deeply, as deeply as the character of the soil and subsoil will permit. From 7 to 10 inches may be regarded as a fair margin, always remembering that the surface soil is the most fertile.

The practice of using small whole tubers for seed cannot be too strongly condemned. It is using the very poorest potatoes to start the next crop. Very often the small tubers come from diseased roots; and, morever, they are mostly immature, having only been half-grown when the plant died down. In using these small tubers, the farmer is actually making a selection of the very poorest potatoes as seed.

We select only potatoes from hills yielding well, and we do not use any diseased tubers for seed. The selection is done when digging. After digging, the seed potatoes are spread out in a well-lighted, cool shed, in a single layer, so that they are well shot by planting time. We never allow the seed to make long weak shoots by being kept in bags or in a pit. Seed potatoes should never be pitted.

The size of the sets is a matter for the grower's judgment. Small sets will give just as good results as large ones, if the soil is moist and the conditions favourable at planting time, provided the seed is selected from *high*

yielding hills only. There is no occasion to worry about the number of eyes to the set. Large sets are best if the soil is on the dry side. Cut seed gives just as good results as uncut; in fact, if the seed is carefully selected it will be so large that it must be cut. Cutting also has the advantage of enabling the grower to see if the potato is sound inside.

Before planting, we treat all seed with formalin, the solution being 1 pint formalin to 30 gallons of water. This is very necessary to prevent scab, which is one of the worst of potato diseases, as its spores remain in the ground for six or seven years.

The distance apart to plant the sets should be regulated by the climate and soil of the district. In cool districts, with heavy rainfall, such as this, 2 feet x 3 feet is quite close enough, but in hotter and drier districts the plants will not make such vigorous growth, and the sets can be planted closer with advantage.

It takes 7 to 9 cwt. of tubers to plant an acre. We plant deeply in open drills, 6 to 8 inches, according to the character of the subsoil. We cover the sets with the plough, and harrow the ground level when all planting is finished.

The time of planting varies with the district, and each grower must use his own judgment. But we never plant potatoes in dry soil. It is far better to wait for rain, as a crop stunted in the early stages of its growth never makes a heavy yield.

When planting, we use a good dressing of complete manure, applying it along the bottoms of the potato drills. From 4 to 6 cwt. per acre appears to be the most profitable amount. Never broadcast the manure for potatoes. It is very important to remember that first-class fertiliser is the only one that should be used, and our practice is to go to a reliable manure firm and ask for the manure recommended by the Chemist of the Agricultural Department to be mixed for us. The following is the formula:—

Blood manure, 2 cwt.
Superphosphate, 2 cwt.
Sulphate of potash, 1 cwt.

We do not buy ready-made mixtures, although they may be slightly cheaper than the above, but prefer to have the exact formula made up. Our reasons are that muriate of potash is sometimes used instead of sulphate of potash, and sulphate of ammonia instead of blood. Muriate of potash is cheaper than sulphate, but we consider it dear at any price, as it affects the quality of the potatoes. We prefer blood to sulphate of ammonia for two reasons: blood tends to prevent the manure from setting hard if not used at once; and, moreover, the results from the sulphate of ammonia do not seem to be so good. Probably it is in too readily available a form.

We never manure land heavily with stable manure, lime, or wood ashes just before planting potatoes. There may be several causes, but we find that to do any of these things is to encourage scab.

When the potatoes are 3 or 4 inches high we run the harrows over the crop to break the surface and kill any young weeds. Then during the growing period we cultivate after every fall of rain, taking care never to go more than 2 or 3 inches deep.

When about 6 inches high we spray thoroughly with a 6–6–50 solution, made as follows :—

Bluestone, 6 lb.
Washing soda, 6 lb.
Water, 50 gallons.

We spray regularly every twelve to fourteen days till the crop is ripe ; but if the weather is dull, wet and muggy, we spray every six days.

Hilling can be done when the potatoes start to flower, but care must be taken not to work the land deeply near the plants, nor to go more than 3 inches deep in the middle between the rows.

PRUNING.

By W. J. ALLEN, Fruit Expert, Department of Agriculture.

EVERY effort is being made to have this booklet available to growers in July. It is a second and revised edition of Mr. Allen's pamphlet published in 1903, which has been out of print for some time.

The booklet deals with the treatment of fruit-trees of all ages, from time of planting till they cease to be worth retaining. The principles of pruning are explained in non-technical language, and their application is shown by illustrations, of which the booklet contains over 200. Different varieties require different treatment for best results, and the best advice which can be given from experience in the Departmental orchards is contained in this booklet.

Obtainable from the Government Printer, Sydney ; price 1s., postage 1d.

TREATMENT OF STUBBLE.

"T.P.M.," a Riverina wheat-grower, asks for the Department's opinion as to ploughing in stubble, and whether straw ploughed in is likely to breed grubs or caterpillars.

Mr. George Valder, Superintendent and Chief Inspector, states :—

Stubble should either be fed-off and returned to the soil indirectly, or should be ploughed in. In this manner humus is added to the soil, and helps to keep it in better condition. If it is intended to follow a wheat crop with wheat, the stubble should be ploughed in sufficiently long beforehand to allow it to rot ; otherwise the soil may be so loose that the best results will not be obtained from the following crop. Ploughing in the stubble will not breed grubs or caterpillars.

Soldering and Brazing

A. BROOKS, Works Overseer.

SOLDER is the name given to several different alloys used for the purpose of making joints between different metals, which, if properly done, do not consist merely of sticking the metals together, but form a real weld or a fresh alloy.

The composition varies very much. Every solder should, and must, be more fusible than the metal to be united or joined together; therefore, hard solders can only be used on metals that will stand a high temperature without melting. Soft solders melt at a low temperature, and may be more generally used.

In preparing to solder, the surfaces to be united must be perfectly clean and lie close together, and the surfaces so cleaned must be protected from the air by a coating of a suitable flux. The usual flux for iron and tin is muriatic acid, more commonly called "spirits of salts," which is weakened or killed by adding water or zinc.

The Tools.

The necessary tools required are a soldering iron, about 1 lb. weight; a block of sal ammoniac; a small brush, usually made of horse-tail hair, bound in a piece of tin as a handle; a glass or earthenware pot to hold the spirits of salts; an old flat file; an old pocket knife; and a fire-pot. The last-named is an oil-drum with a few holes in the bottom, and, say, three holes about 2 inches square in the sides, near the bottom, through which to pass the irons while heating. Where much work is to be done, it is as well to have at least two irons, so that one is in the fire while the other is in use.

Wood and coke are the best fuels to use.

The iron should be drawn out to a point (not sharp), about a quarter of an inch, and slightly rounded off. To prepare it for use, it must first be heated to a dull red heat, and the point for about 1 inch back filed clean while rot; then rub it on all sides on the sal ammoniac, lay a little solder on it, and dip it into the killed spirits. This will tin the point of the iron, and unless it is over-heated in the fire when reheating, it should keep the tinning for some time. The use of the sal ammoniac is sometimes dispensed with; but the tinning is not so good a job. Each time it is heated (not a red heat, but just enough to melt the solder easily) it must be wiped off on a piece of bag, or similar material, and the point dipped into the spirits. It is then applied to the joint in such a way as to heat the metal, and the strap of solder, placed against the point of the iron, runs into the joint and forms the weld. Never use the iron if not hot enough to melt the solder easily.

Solder.

To make your own solder is the surest way to have the right sort. Melt down, in an iron pot, 2 parts lead and 1 part block tin; and when melted, the pot being red hot, skim off the refuse that floats on top. Then with a ladle, first slightly heated, pour the solder into the hollows of a sheet of small corrugated iron, making long or short sticks as required. This mixture will do for ordinary work on galvanised iron or heavy tinware, such as dairy cans.

Brazing.

Brazing is done with granulated spelter and borax, spread over the surface of the joint, and exposed to a clean open fire. The joint to be made must be well cleaned and otherwise prepared previous to heating.

The following table shows mixtures for different solders and brazings to be used for the purposes mentioned:—

<table>
<tr><th rowspan="2">Solders.</th><th colspan="4">Materials.</th><th rowspan="2">Purposes</th><th rowspan="2">Fluxes.</th></tr>
<tr><th>Tin.</th><th>Lead.</th><th>Zinc.</th><th>Copper</th></tr>
<tr><td>Brazing spelter, soft ...</td><td>...</td><td>...</td><td>1</td><td>1</td><td>For brass-work .</td><td rowspan="2">Borax.</td></tr>
<tr><td>Do hard ..</td><td>...</td><td>..</td><td>2</td><td>3 to 6</td><td>For copper, iron, and steel.</td></tr>
<tr><td>Plumber's solder, fine ..</td><td>1</td><td>1½</td><td>...</td><td>...</td><td rowspan="2">For ordinary work.</td><td rowspan="3">Muriatic Acid or Spirits of Salts.</td></tr>
<tr><td>Do ordinary</td><td>1</td><td>2</td><td>...</td><td>...</td></tr>
<tr><td>Do coarse...</td><td>2</td><td>1</td><td>...</td><td>...</td><td>For Tinman's work.</td></tr>
</table>

INFERIOR BUTTER-BOXES AND MORE INFERIOR TIMBER.

DURING the last three months the dairying industry has been hampered considerably by the want of butter-boxes of a suitable character. Some of the boxes placed on the market are too rough to properly represent the industry, but a worse state of things is noticeable in the presence of green and improperly dried timber for the boxes.

Some factories have suffered considerable monetary loss during the season now drawing to a close, through having to use boxes of the kind referred to. The timber was so green in some of these that mould-growth flourished there in a very vigorous manner, so much so that by the time the butter was placed on the floors in Sydney for export, the mould-growth had grown right through the outside parchment paper, and on to the surface of the butter. In most cases the timber was almost wholly responsible for the presence of the mould-spores, or seeds from which the moulds germinated.—M. A O'CALLAGHAN.

(3) White Leghorn, P. Lowe's pen.
(5) White Leghorn, H. Hammill's pen.
(1) Black Orpington, D. Kenway's pen.
(2) Black Orpington, A. E. Henry's pen.
(4) White Leghorn, A. J. Wood's pen.
(6) White Leghorn, T. Partridge's pen.

Egg-laying Competitions at Hawkesbury Agricultural College.

NINE YEARS' RECORDS.

Still Breaking Fresh Ground—New Data for the Poultry World.

D. S. THOMPSON, Poultry Expert.

THE egg-laying competitions organised by the *Daily Telegraph*, and conducted at the Hawkesbury Agricultural College, concluded another year on 31st March, 1911.

The experimental work in connection with the competition was, with the hearty co-operation of the poultry breeders, extended, and as a result entirely new and authentic data can now be given to the poultry world, upon at least two points of exceeding importance to the men and women who depend upon poultry-farming for a living. It is these new avenues of experiment that have given the tests for the past year a greater value than any of the preceding series. For the first time in poultry history accurate data have been accumulated as to the productivity and value of third-year hens as layers. The facts established quite upset the preconceived ideas of the majority of practical poultry-farmers, who would have been prepared to stand by their opinion that the light breeds would excel the heavy ones in the third year. The actual result, however, is that the Black Orpington and Langshan quite overshadow the popular White Leghorn, and by giving an average net profit of over 6s. per hen have demonstrated their profitableness in the third year, provided they prove good layers in their first and second seasons. The best strains of White Leghorns were under observation in this test, and the verdict must be that the profit of 3s. 2d. per head which they earned does not warrant them being kept for the third year's laying.

The "dry-feeding" test was arranged to demonstrate the economy and value, if any, of this system of having a supply of grain and the component parts of the ordinary mash always before the hens, in comparison with the orthodox method of feeding. While the general result of this test is disinctly in favour of the ordinary system of feeding a requisite allowance of wet mash in the morning and grain in the evening, one point has been brought out which is worthy of further experiment. The only pen that had been reared on dry feed, and that had been accustomed to the "dry mash" before entering the competition, was that of the Hillcrest Poultry Farm, which altogether outdistanced all its compeers. The deduction is that pullets

reared on the hopper (dry feed) system will lay well on dry feeding, and, though they yield fewer eggs, there may be a sufficient compensation in the economy of labour, resulting from the fact that they can in this way be fed once a week instead of twice a day. This is an aspect of the problem upon which the experiment just concluded is inconclusive.

The general system of feeding, which has given such good results in the past, has not been departed from in the sections for hens. There has been the morning mash of one part bran and three parts pollard, seasoned with salt, and mixed hot in the winter and cold in the summer, with the addition of minced bullocks' livers and the soup therefrom twice a week. The evening ration has varied from wheat to maize, the latter chiefly in the cool weather, about 7 bushels of wheat being used to every 4 of maize. The fowl pens are permanently grassed with couch, and the hens had a good green picking the year through. Nevertheless, chaffed green lucerne and rape was also fed to them at midday during the greater part of the twelve months.

The committee, ever on the alert to make these competitions increasingly instructive, has again arranged to break new ground during the current year. The relative value of feeding laying hens with and without animal food will be thoroughly tested. For this purpose, ten pens of pullets will be fed without meat, while ten pens of corresponding breeds, ages, and strains, will be fed on the ordinary ration, which includes meat and soup twice a week, for purposes of comparison. Both heavy and light breeds will participate in the test, the result of which should settle a debatable point upon which our most expert poultry-farmers are at variance. The other new feature is the testing of ducks in their third year, a point upon which the world at present has no authentic data.

The executive management was in the hands of a committee consisting of Messrs. H. W. Potts (Principal of the Hawkesbury College), D. S. Thompson, E. Ellis, W. T. Ely, A. E. Henry, L. L. Ramsay, E. Waldron, and A. A. Dunnicliff, jun. (the *Daily Telegraph*).

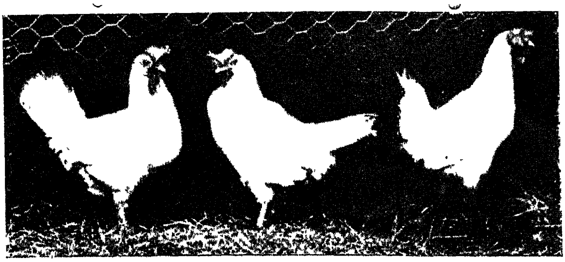
THE PRIZE-WINNERS.

Liberal cash prizes were given, amounting to £115, and including £50 donated by the *Daily Telegraph*. The following were the winners in the various sections:—

Third-year Hens.

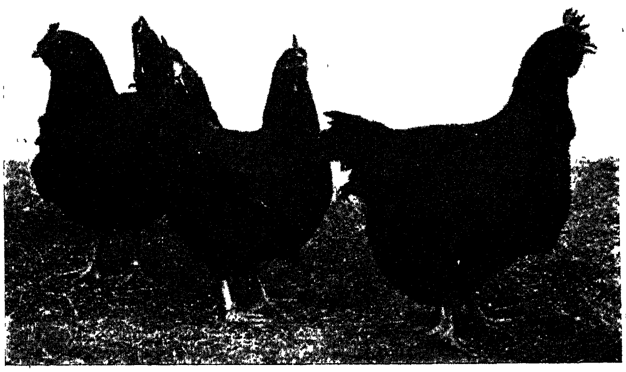
Greatest number of eggs in the third twelve months :—A. E. Henry (1), £3; J. Kelly (2), £2; F. J. Brierley (3), £1.

Monthly prize of 10s. for the highest total from a pen :—April: Forest Home Poultry Farm, 62 eggs. May: Forest Home Poultry Farm, 58. June: J. Kelly, 59. July: W. Mitchell, 76. August: F. J. Brierley, 105. September: F. J. Brierley, 127. October: H. Ellis, 124. November: A. E. Henry, 112. December: F. J. Brierley, 105. January: A. E. Henry, 92. February: A. E. Henry and J. Kelly, 84, divided. March: Mrs. E. Scaysbrook, 57.



J. Waugh's White Leghorns.

Winners of trophy for pen laying the most eggs in two years without the replacement of a bird.



D. Kenway's Black Orpingtons.

Winners of general utility prize in Ninth Annual Competition.

Also winners of Winter test.

P. Lowe's White Leghorns.

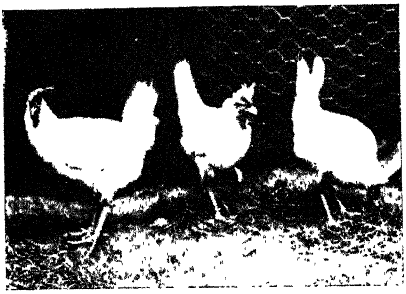
Greatest number of eggs in second twelve months, and in the two years' test.

Also highest market value of eggs in the two years.

A. E. Henry's Black Orpingtons.

Greatest number of eggs in third year.

EGG-LAYING COMPETITIONS, HAWKESBURY AGRICULTURAL COLLEGE, N.S.W.



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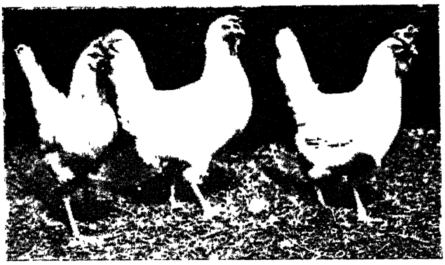

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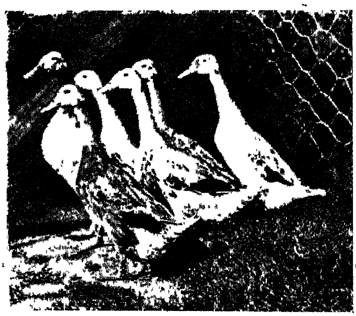

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EGG-LAYING COMPETITIONS, HAWKESBURY AGRICULTURAL COLLEGE, N.S.W.

1. H. Hammill's White Leghorns. Winners of Ninth Annual Competition (Greatest number of eggs, and market value).
2. F. J. Brierley's White Leghorns. Second in Ninth Annual Competition.
3. T. Partridge's White Leghorns. Second, greatest number of eggs in two years' test.
4 and 7. Mrs. B. Wakfer's Cantonese Ducks.

Second-year Hens.

Greatest number of eggs in the second twelve months :—P. Lowe, 1,045 eggs (1), £3 ; A. J. Wood, 1,033 (2), £2 ; Mrs. F. S. Howell, 1,000 (3), £1 10s. ; J. Waugh, 984 (4), £1 ; T. Partridge (5), 10s.

Greatest number of eggs in the two years :—P. Lowe (1), £3 ; T. Partridge (2), £2 ; J. Waugh (3), £1.

Winter test (April to July inclusive) :—Mrs. F. S. Howell, 339 eggs (1), £2 ; F. R. Reynolds, 241 (2), £1 ; M. Foran, 222 (3), 10s.

Market value of eggs for the two years :—P. Lowe (1), £2 ; T. Partridge (2), £1 10s. ; Range Poultry Farm (3), £1.

Monthly prize of 10s. for highest total :—April : Mrs. F. S. Howell, 59 eggs. May : Mrs. F. S. Howell, 107. June : Range Poultry Farm, 75. July : G. Wright, 112. August : P. Lowe, 128. September : P. Lowe, 139. October : J. Waugh and P. Lowe, 142, divided. November : W. C. Cox, 143. December : A. J. Wood, 120. January : J. Waugh, 118. February : J. Waugh, 107. March : P. Lowe, 105.

Special prize of £5, or trophy of the value of £5 (at option of winner), for pen laying the most eggs in the two years without the replacement of a bird :—J. Waugh.

Ninth Annual Competition.

Greatest number of eggs in the twelve months :—H. Hammill (1), £5 ; F. J. Brierley (2), £4 ; Hillcrest Poultry Farm (3), £3 ; F. Hopkins (4), £2 ; W. T. Ely (5), £1 10s. ; J. J. McKenna, jun. (6), £1 ; Hillcrest Poultry Farm (7), £1 ; C. C. Kennett (8), £1.

Winter test (April to July inclusive) :—D. Kenway, 433 eggs (1), £3 ; F. J. Brierley, 420 (2), £2 ; C. C. Kennett, 411 (3), £1 10s. ; Hillcrest Poultry Farm, 407 (4), £1.

Market value of eggs for twelve months :—H. Hammill (1), £2 10s. ; Hillcrest Poultry Farm (2), £1 10s. ; F. J. Brierley (3), £1.

General utility (open to pens the hens in which averaged at least 6 lb. in weight on March 1, 1911 ; decided by the number of eggs laid) :—D. Kenway, total weight of hens 40 lb. (1), £1 10s. ; A. E. Henry, 37 lb. (2), £1 ; Roach and Trickett, 44 lb. (3), 10s.

Monthly prize of 10s. :—April : Hillcrest Poultry Farm, 85 eggs. May : D. Kenway, 150. June : C. C. Kennett, 130. July : J. Gamble, 143. August : H. G. McKittrick, 139. September : E. Waldron, 151. October : S. Champion, 150. November : E. Boxsell and G. R. Nichols, 131, divided. December : F. J. Brierley, 119. January : Hillcrest Poultry Farm, 121. February : H. Hammill, 97. March : W. T. Ely, 93.

Dry-feeding Test.

Greatest number of eggs in twelve months :—Hillcrest Poultry Farm (1), £2 10s. ; D. Kenway (2), £1 10s. ; C. C. Kennett (3), £1.

Second-year Ducks.

Greatest number of eggs in the second twelve months :—G. Rogers (1), £2 10s. ; D. Salter (2), £1 10s. ; G. E. O. Craft (£3), £1.

Second Annual Duck Competition.

Greatest number of eggs in the twelve months :—G. Rogers (1), £5 ; H. Short (2), £3 ; G. Howard (3), £2 ; G. Plowman (4), £1.

Market value of eggs for the twelve months :—G. Rogers (1), £1 10s. ; G. Howard (2), £1 ; H. Short and G. E. O. Craft (equal 3), 5s. each.

Monthly prize of 10s. (open to both tests) :—April : G. Rogers, 81. May : G. Rogers, 142. June : G. Rogers, 165. July : G. Howard, 166. August : Bright and Thompson and A. R. Jardine, 159, divided. September : G. Rogers, 159. October : G. Rogers, 163. November : G. Rogers, 149. December : G. Rogers, 122. January : G. Rogers and C. Kenny, 58, divided. February : Mrs. B. Wakfer, 56. March : G. Howard, 75.

GENERAL REVIEW.

The Dry-feeding Test.

The ten pens of pullets running contra to ten pens in the ninth competition were respectively from the same owners, and of the same varieties, strains, ages, and in every way similar birds, so this constituted a fair test. The dry-feeding system was greatly boomed in America, and even by some in Australasia, as some entirely new system from which extraordinary results were obtainable. We Australians are always ready to learn and gain by knowledge, and on those grounds this test was made. It has demonstrated what most people believed—that hens can be fed on a dry ration only, and fairly successfully. This is of some importance for the busy city man, who has the hobby of looking after a small poultry yard. There is the knowledge that his hens can be fed and do fairly well even under this method of feeding. This is about the only thing that can be said in its favour.

In carrying out the test, each poultry-house was provided with four boxes, of 1 gallon capacity. These were filled up every Monday morning with wheat, maize, pollard and meat meal mixed, and bran respectively. As to the economy in labour, the poultryman says he would much rather feed every day in the regular way than enter the houses and fill up the boxes once a week. Chaffed green lucerne was also fed to the "dry" pens daily, the same as to all other pens. The dry feeders were most partial to wheat, secondly to maize, and they consumed a fair quantity of pollard for the sake of the meat that was mixed through it, but they ate very little bran. It was noticed that these hens drank a much greater quantity of water than the others. While the system was much behind the ordinary up-to-date method of feeding in egg-production, it had also its drawback in encouraging a large number of mice about the pens, which, no doubt, consumed a good deal of the hens' food. The dry feeding proved more costly, averaging 7s. 4¾d. per hen for the year, as compared with 5s. 8d. for ordinary feeding.

Hens' Third-year Laying.

The experiment in keeping hens for the third year gives us the first data in regard to this that have been published in the world. One writer (Columella) says, "Dispose of all old hens, for after three years they become unfruitful." Well, they do not become unfruitful, but there is no reason to doubt that they become far less profitable. However, Columella did not give figures for it, although he discovered this 2,000 years ago.

Second-year Hens.

The second-year test was the fourth of this series. The great value of these continuous experiments lies in their conclusiveness. They have been carried out in both dry and wet years. Seven of the nine years that have passed, however, were comparatively dry. Possibly the next seven or eight may cover a wet cycle, and some of our conclusions may thereby be modified. The second-year hens in this last test sustained the data already accumulated in regard to profits, and also on the point that, generally speaking, the hens which lay best in the first year will also do so in their second season.

The Pullets.

The average returns from the annual (first-year) competition show a decrease compared with the previous year, due largely to the continuous heavy rains in January and February. There is no doubt, however, that the average of 181 eggs per hen in 1909-10 can be improved upon, not so much from the top-notchers, but from the bottom pens. There is yet a possibility of bringing the minimum up to 1,000 eggs per pen. The pullets, taken as a whole, were in point of quality well up to those of previous years, although no doubt little improvements can still be effected. Wyandottes and Orpingtons can be improved in the matter of maturity. Competitors should hatch largely in July and August to have suitable pullets to select from. Leghorns should be August and September hatched, and the very early layers discarded for competition purposes; that is, any that start laying in January and February, as many do.

The Ducks do Splendidly.

The second-year duck test has been quite a surprise to us, and no doubt will be equally so to many of the best poultry thinkers of the world. The test has demonstrated that the Indian Runner duck will lay better in the second year than any of the breeds of fowls in their second season. Further, had not G. Rogers' whole pen of first-year ducks been killed by a fox, after laying 1,195 eggs in a week less than nine months, they might possibly have put up a world's record. The ducks' average in future should largely increase. Ducks, however, are not so profitable as hens, as they cost more to feed, and their eggs realise a lower average price on the market for the full year.

The average of the first-year ducks increased greatly over that of the previous competition, in which no animal food of any kind was fed. During the past year, however, we used 5 cwt. of meat meal, mostly in June and July, and, again, in January and February, with good results. There is no doubt that the meat meal is a fairly good substitute for fresh meat, and fed sparingly it is an aid to egg-production. However, the price paid—20s. per cwt.—is prohibitive.

MORTALITY AND DISEASE.

The mortality percentage attributable to disease was lower than in any previous year. The deaths included 7 third-year hens, 24 second-year hens, 17 wet-mash pullets, 2 dry-mash pullets, 3 first-year ducks, and 3 second-year ducks. All these deaths were from ovarian causes. There were also two pullets killed by native cats and 21 ducks killed by foxes. The deaths of ducks from disease only represented 4 per cent., as compared with 8 per cent. in the previous year. The death roll among the pullets was 5 per cent. There was no infectious disease among the birds.

THE FINANCIAL ASPECT.

The cost of feeding was based on the following contract prices for the staples:—Wheat 4s. 6d., maize 2s. 9d., and bran and pollard 1s. per bushel. The values of the eggs represent the prices realised in the Sydney market, less freight, commission, and charges. The total surplus over the cost of feed on the 100 pens of hens was £221 7s., and £38 0s. 7d. on the 25 pens of ducks; grand total, £259 7s. 7d.

THIRD-YEAR HENS.

Cost of feeding: Wheat £6 15s., maize £2 15s., bran and pollard £5, meat £1, green food £1, shell grit, 10s.; total, £17. Market value of eggs laid, £31 5s. 8d.; leaving a profit of £14 5s. 8d.

SECOND-YEAR HENS.

Cost of feed: Wheat £36, maize £11, bran and pollard £24, meat £4, shell grit £2; total, £77. Market value of eggs, £140 19s. 7d.; leaving a surplus of £63 19s. 7d. over the cost of feed.

NINTH ANNUAL COMPETITION.

Cost of feed: Wheat £31, maize £14, bran and pollard £21 8s., meat £4, shell grit £3 5s.; total, £73 13s. Market value of eggs, £195 10s. 10d., leaving a surplus of £121 17s. 10d. over the cost of feed.

DRY-FEEDING TEST.

Cost of feed: Wheat £9, maize £6 2s. 6d., bran 15s., pollard £3 1s., meat meal £2, green feed £1, shell grit 10s.; total, £22 8s. 6d. Market value of eggs, £43 10s. 5d., leaving a surplus of £21 3s. 11d. over cost of feed.

SECOND-YEAR DUCKS.

Cost of feed: Bran and pollard £13, meat meal 16s., green food 12s., shell grit 12s.; total, £15. Market value of eggs, £23 14s. 1d., leaving a surplus of £8 14s. 1d. over the cost of feed.

FIRST-YEAR DUCKS.

Cost of feed: Bran and pollard £52, meat meal £3 4s., green feed £2 8s., shell grit £2 8s.; total, £60. Market value of eggs, £89 6s. 6d., leaving a surplus of £29 6s. 6d. over the cost of feed.

THE DETAILED RETURNS.

The following tables give full details of the number of eggs laid by each pen of six birds, together with the market value and the average weight of the eggs. The figures in parentheses after each competitor's name indicate the number of birds replaced owing to deaths over the whole period of the section. In the ninth annual competition the hens that were fed on the dry-mash system are denoted by the asterisk (*) preceding the owner's name.

NINTH ANNUAL COMPETITION.

Though this is entitled the Ninth Annual Competition for convenience, it actually includes the 40 pens in that test and 10 pens in the Dry Mash Test. These latter are marked with an asterisk.

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz. (oz)	Market Value.
1. H. Hammill (0), Kogarah : White Leghorns	44	100	114	138	133	133	131	127	111	105	97	88	1321	24	134/5
2. F. J. Brierley (0), Cheltenham : White Leghorns	84	99	110	127	127	140	137	127	119	93	60	45	1268	25	128/9
3. Hillcrest Farm (0), Berowra : White Leghorns	85	93	128	101	125	135	123	120	108	84	88	72	1262	25	131/2
4. F. Hopkins (0), Byron Bay : White Leghorns	34	113	114	118	130	135	119	111	110	80	61	87	1212	24	120/9
5. W. T. Ely (0), Rydalmere : White Leghorns	74	105	104	102	127	125	135	123	107	67	30	93	1192	24	124/9
6. J. J. McKenna, jun. (0), Kenthurst : White Leghorns	51	103	100	117	133	134	121	110	111	65	64	62	1171	24½	110/6
7. *Hillcrest Farm (0), Berowra : White Leghorns	74	66	112	97	113	103	80	118	112	121	59	76	1131	24	109/6
8. C. C. Kennett (1), Glenfield : White Leghorns	81	63	130	137	131	127	111	99	77	62	51	59	1128	24	116/2
9. D. Kenway (2), Beecroft : Black Orpingtons	55	150	115	113	103	150	108	101	77	30	62	55	1119	24	118/8
10. S. Ellis (0), Botany : White Leghorns	18	106	80	97	132	128	132	124	98	65	66	71	1117	26	110/9
11. E. Greentree (0), Wyong : White Leghorns	2	62	114	117	128	141	142	115	104	63	64	59	1111	26	106/3
12. E. Boxsell (1), Tilba Tilba : White Leghorns	8	68	107	127	128	131	146	131	65	71	55	72	1109	24½	109/6
13. R. Jobling (0), Wallsend : Silver Wyandottes	13	90	128	117	141	127	110	79	95	61	79	60	1090	24	109/6
14. J. Gamble (0), Ashfield : Langshans	7	66	98	143	116	137	117	111	92	72	68	61	1086	25½	106/1
15. C. R. G. Macdonald (2), Ingleburn : White Leghorns	40	91	97	110	121	138	137	110	89	55	63	34	1085	24½	107/6
16. A. C. Rule (0), Croydon : Silver Wyandottes	12	83	112	138	131	129	119	99	78	72	40	58	1071	25	106/5
17. H. G. McKittrick (1), S. Grafton : White Leghorns	19	53	61	120	139	144	145	113	116	63	62	32	1067	24½	99/5
18. R. J. Stuart (0), Blacktown : White Leghorns	15	73	90	121	129	134	110	122	110	68	53	37	1052	25	101/5
19. D. Morris (1), Kellyville : White Leghorns	22	69	64	68	114	134	133	115	118	65	52	87	1041	24	100/5
20. S. Champion (0), Eskbank : White Leghorns	7	75	93	77	112	135	150	127	80	75	44	58	1033	25½	99/-
21. W. Smith (1), Rydalmere : Black Orpingtons	13	39	108	98	104	130	127	127	109	90	53	32	1030	26½	91/6
22. Forest Home P.F. (0), Adamstown : Langshans	83	70	89	121	130	107	113	66	80	57	58	53	1027	25	106/4
23. O'Hearn Bros. (0), Maitland : White Leghorns	12	11	39	118	131	141	146	126	106	91	67	35	1023	25½	91/1
24. G. R. Nicholls (0), Llandilo : White Leghorns	0	13	65	120	119	143	146	131	94	56	55	80	1022	25½	93/5
25. G. Hopping (1), Ingleburn : Silver Wyandottes	41	74	98	125	130	121	116	90	79	56	44	44	1018	24	101/8
26. Bright and Thompson (0), Dulwich Hill : Brown Leghorns	29	79	78	82	134	137	122	119	87	77	32	48	1014	24	98/1
27. *D. Kenway (0), Beecroft : Black Orpingtons	52	69	94	85	121	92	69	69	111	106	51	89	1008	24½	104/3
28. *C. C. Kennet (0), Glenfield : White Leghorns	22	22	104	115	127	96	77	92	118	118	48	51	990	25	96/8
29. D. Quinlan (1), Spring Hill : White Leghorns	3	21	65	112	112	138	127	110	108	77	42	59	974	26	87/2
30. Mrs. J. W. Cox (3), Marrickville : Langshans	7	21	58	93	133	130	130	116	116	86	37	46	973	26	87/8
31. *Mrs. J. W. Cox (1), Marrickville : Langshans	32	63	39	110	120	97	73	82	90	95	58	90	954	25	96/8
32. E. Waldron (0), Willoughby : Black Orpingtons	0	5	77	101	104	151	138	104	80	79	43	68	950	25	86/5
33. T. Lawrence (2), Cowra : White Leghorns	4	33	76	69	107	130	130	108	85	68	59	57	926	26½	86/-
34. *J. J. McKenna, jun. (0), Kenthurst : White Leghorns	38	54	85	98	105	83	74	72	106	111	37	55	918	23	93/7
35. A. R. Jardine (0), North Ryde : Cuckoo Leghorns	3	84	76	110	123	120	87	95	52	65	24	65	904	24½	89/7
36. A. E. Henry (0), Katoomba : Black Orpingtons	8	55	56	77	93	125	118	99	92	49	66	63	901	28	86/-
37. Roach and Trickett (1), Wollongong : Black Orpingtons	6	37	64	119	137	132	114	86	93	45	25	31	889	28	81/9
38. C. Gooch (2), Enfield : Brown Leghorns	9	15	29	75	93	133	130	129	81	81	18	56	879	24½	80/1
39. *S. Ellis (0), Botany : White Leghorns	39	75	58	49	109	97	83	99	95	45	44	77	870	24	87/5
40. *F. J. Brierley (1), Cheltenham : White Leghorns	72	10	85	97	88	95	62	92	93	95	43	24	856	25½	84/7
41. J. Plunkett (1), Berowra : Black Orpingtons	4	50	82	56	85	110	117	89	89	61	52	53	848	24	80/1
42. *R. J. Stuart (0), Blacktown : White Leghorns	12	26	68	76	114	96	91	84	87	112	37	27	830	25	77/1
43. R. Plowman (1), Orange : Silver Wyandottes	16	47	88	110	105	97	73	67	67	64	41	53	828	25	82/9
44. L. L. Ramsay (0) Carlingford : Black Orpingtons	0	0	60	105	97	106	115	86	87	53	62	3	774	24½	68/2
45. Mrs. E. L. Scott (0), Willoughby : White Orpingtons	27	43	32	111	114	107	71	59	65	55	43	38	765	25	74/6
46. *E. Waldron (0), Willoughby : Black Orpingtons	0	35	82	76	112	81	65	71	59	66	50	37	734	24	70/5
47. Mrs. Scaysbrook (0), Gosford : Black Orpingtons	13	60	77	76	79	84	65	56	61	47	27	48	693	25½	70/4
48. F. C. Johnson (0) Manly : Minorcas	24	64	43	60	79	92	104	88	69	28	34	0	685	24	65/1
49. J. J. Brann (1), Albury : Silver Wyandottes	0	0	6	55	98	116	100	68	77	43	57	38	658	24½	56/6
50. *L. L. Ramsay (0), Carlingford : Black Orpingtons	3	27	60	35	70	56	37	57	45	55	13	53	511	25	50/3

SECOND-YEAR HENS.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second year.	Grand Total.	Weight per doz.	Market Value.
																oz.	
1. P. Lowe (1), Lower Portland : White Leghorns	1324	6	11	29	63	128	139	142	128	96	103	95	105	1045	2369	26	254/2
2. T. Partridge (1), Marrickville : White Leghorns .. .	1368	17	10	24	89	111	116	138	117	97	106	84	50	959	2327	27	252/7
3. J. Waugh (0), Kurri Kurri : White Leghorns .. .	1296	26	16	4	58	61	133	142	139	117	118	107	63	984	2280	25	244/-
4. J. Dunlop (0), Marrickville : Brown Leghorns .. .	1249	16	9	17	64	100	123	133	132	121	112	97	75	999	2243	25	214/3
5. Range P.F. (0), Toowoomba (Q.) : White Leghorns .. .	1341	11	41	75	80	99	115	112	110	96	62	53	47	901	2242	25	250/8
6. A. J. Wood (1), Quirindi : White Leghorns .. .	1179	11	26	69	96	116	132	122	120	120	85	83	53	1033	2212	25	236,9
7. G. Wright (0), St. Peters : White Leghorns	1238	0	15	39	112	101	124	125	113	106	86	71	57	919	2187	27	235/-
8. Griffith Bros. (0), Balgowlah : White Leghorns ..	1263	17	38	40	61	96	98	108	110	91	87	65	54	865	2128	25	236/8
9. Tipper and Rose (0), Belmore : White Leghorns .. .	1266	6	0	30	55	124	129	119	96	97	84	68	48	856	2122	26	228 9
10. J. Jensen (3), Sefton Park : White Leghorns	1276	3	0	41	69	93	117	120	111	80	103	46	39	822	2098	25	226/-
11. M. A. Vennard (0), Eastwood : White Leghorns . ..	1306	20	16	28	64	108	117	115	93	91	73	42	21	788	2094	25	228/9
12. S. C. Jones (1), Wentworthville : White Leghorns .	1270	21	35	66	48	99	108	116	98	78	68	50	34	821	2091	26	228/6
13. Wharepaka Yds. (2), Berowra : White Leghorns .. .	1214	4	5	49	65	110	133	122	110	94	69	58	54	873	2087	25	223/8
14. M. Foran (0), Concord : Black Orpingtons	1130	43	35	58	86	113	106	106	98	92	89	46	75	938	2068	25	232/-
15. J. O. Smith (2), Byron Bay : White Leghorns.. ..	1225	14	21	35	31	117	126	138	123	98	77	30	10	820	2045	27	211/3
16. D. J. Stephens (0), Rouse-hill : White Leghorns ..	1211	0	5	51	32	86	119	134	115	92	110	58	28	830	2041	27	220/9
17. R. H. Stewart (2), Berowra : White Leghorns	1394	31	28	35	46	89	86	73	73	79	50	37	19	646	2010	25	235/2
18. G. Du Faur (1). Turramurra : White Leghorns .. .	1134	26	25	67	160	120	132	121	80	107	57	26	33	897	2031	26	226/8
19. O. J. Mitchell (0), Lower Portland : White Leghorns .	1195	16	0	26	91	109	123	132	111	99	74	17	25	823	2018	26	208/1
20. Mrs. F. S. Howell (0), Maitland : Langshans	995	59	107	65	108	114	117	110	82	65	84	41	48	1000	1995	25	221/9
21. L. Everingham (1), Central Colo : Black Orpingtons .	1131	26	43	61	56	114	118	106	113	74	79	44	17	851	1982	25	212/6
22. L. S. Luck (1), Moruya : White Leghorns	1038	6	42	56	65	91	111	124	119	100	93	72	61	940	1978	25	213/-
23. A. F. Emmett (1), Moruya : White Leghorns	1199	17	16	11	42	97	105	109	112	89	80	44	42	764	1963	25	214/3
24. R. Boardman (2), Camden : White Leghorns	1090	14	12	20	29	99	120	116	118	88	90	93	62	861	1951	28	204/9
25. Farradene Yds. (2), Kemp's Creek : White Leghorns ..	1113	6	8	19	81	65	109	120	113	106	93	72	34	826	1939	26	198/6
26. A. R. Browne (1), Hawke's Bay (N.Z.) : White Leghorns ..	1245	10	37	49	84	94	97	89	82	38	44	41	18	683	1928	25	219/-
27. A. R. Kennedy (1), Guildford : Black Orpingtons	1217	32	3	3	73	86	92	103	72	54	73	66	53	710	1927	27	206/5
28. A. F. Caller (1), Ryde : Black Orpingtons	1064	55	50	33	40	62	107	75	57	77	66	71	62	755	1819	25	207/7
29. W. K. Graham (1), Moruya : White Leghorns . .	1061	14	4	0	26	82	110	118	103	101	103	35	21	717	1778	25	189/8
30. E. R. Reynolds (2), Paterson : Black Orpingtons .. .	1068	28	66	74	73	75	100	95	79	42	54	0	15	701	1769	25	201/-
31. R. Maxwell (2), Moruya : Silver Wyandottes	1236	53	44	40	73	59	68	49	59	21	18	9	34	530	1766	25	216/2
32. Fuller Bros. (1), Kiama : White Leghorns	1003	0	4	10	12	89	127	120	112	87	91	56	37	754	1757	27	181/5
33. A. W. Hodson (0), Enfield : White Leghorns	1078	0	0	1	43	96	117	113	129	78	73	23	0	673	1751	26	191/9
34. E. J. Hunt (1), Berowra : White Leghorns	1052	0	0	9	34	71	110	123	98	87	75	56	33	696	1748	25	182/5
35. W. C. Cox (0), Canterbury : White Leghorns . .	1024	0	0	22	14	75	117	111	143	88	84	42	21	717	1741	25	181/5
36. R. H. Erwin (1), Rooty-hill : White Leghorns	997	0	12	32	44	87	114	113	89	87	85	47	21	731	1728	25	185/1
37. L. K. Pettit (0), Albury : White Leghorns	1037	5	2	0	8	103	124	117	106	62	85	52	18	682	1719	27	177/9
38. Cowan Bros. (0), Burwood : White Leghorns	1088	16	5	10	43	90	98	86	96	68	45	6	22	585	1673	27	178/6
39. J. C. Gould (2), New Lambton : White Leghorns	1064	0	0	7	37	67	92	107	90	63	61	34	17	575	1639	25	173/-
40. R. H. Blamey (0), Kogarah : Black Orpingtons .. .	988	12	13	10	43	40	105	95	86	72	62	42	32	612	1600	26	168/6

THIRD-YEAR HENS.

Owner and Breed.	First Year.	Second Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Jan.	Feb.	March.	Third Year.	Grand Total.	Weight per doz.	Value Third Year.	Total Value.
																	oz.		
1. A. E. Henry (1), Katoomba: Black Orpingtons	1230	994	40	22	23	20	73	113	108	112	89	92	84	47	823	3047	27	78/9	329/3
2. J. Kelly (3), Moorman: Black Orpingtons ..	1288	958	36	38	59	17	56	87	82	99	75	89	84	52	774	3020	26	76/2	323/2
3. F. J. Brierley (3), Cheltenham: White Leghorns	1330	989	3	4	6	19	105	127	117	104	105	72	74	8	744	3063	26	62/8	320/-
4. W. Mitchell (1), North Ryde: Cuckoo Leghorns	1230	1008	25	13	5	76	76	116	100	104	67	84	41	36	743	2981	26	[illegible]	311/8
5. Forest Home P.F. ( ), Adamstown: Langshans	1192	950	62	18	67	42	88	96	86	82	73	60	43	25	742	2884	25	73/6	304/9
6. Mrs. E. Scaysbrook (0), Gosford: Black Orpingtons.	1221	858	21	36	10	48	61	90	85	70	49	71	58	57	656	2735	26	64/4	291/7
7. S. Ellis (0), Botany: White Leghorns ..	1333	974	5	4	6	43	84	103	93	87	75	60	46	32	638	2945	28	54/-	314/5
8. H. Ellis (2), Harris Park: White Leghorns ..	1110	861	0	0	0	6	97	116	124	102	75	64	15	20	619	2590	25	50/4	256/9
9. Bright and Thompson (2), Dulwich Hill: White Leghorns.	1312	971	8	0	0	29	93	106	106	90	67	60	39	14	612	2895	27	52/4	300/5
10. W. Frame (1), Canterbury: White Leghorns..	1228	811	5	0	2	19	69	111	103	105	73	38	35	7	567	2606	26	45/9	270/5

First-year Ducks.

Owner and Breed.	April	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. G. Rogers (6), North Ryde : Indian Runners	28	117	165	164	157	159	163	149	93	11	12	60	1278	31	113/7
2. H. Short (1), Ryde : Indian Runners	70	135	114	118	137	132	117	112	117	31	17	58	1158	32	104/7
3. G. Howard (1), Marrickville : Indian Runners	29	89	150	166	155	126	112	115	73	22	24	75	1136	31	105/9
4. G. Plowman (0), North Bondi : Indian Runners	53	112	136	159	157	137	113	95	89	22	28	21	1122	30	102/1
5. G. E. O. Craft (0), Ingleburn : Indian Runners	76	141	150	128	107	110	98	121	91	47	28	23	1120	30	104/7
6. T. A. Fuller (0), Ryde : Indian Runners	9	83	140	154	143	133	130	1[illegible]0	98	26	42	36	1114	32	99/4
7. A. R. Jardine (5), North Ryde : Indian Runners	2	58	157	141	159	149	157	92	106	26	20	46	1113	31	96/5
8. Bright and Thompson (0), Dulwich Hill : Indian Runners	28	59	82	130	159	144	126	111	104	36	48	63	1090	33	93/9
9. C. Kenny (4), Ryde : Indian Runners	20	76	146	141	122	138	120	112	81	58	40	30	1084	31	96/9
10. Mrs. B. Wakfer (0), Chatswood : Cantonese	4	32	116	112	124	136	142	131	108	9	56	60	1030	27	[illegible]6/3
11. Mrs. B. Levi (1), Belmore : Indian Runners	0	72	132	134	119	139	131	121	78	3	50	32	1011	31	88/-
12. E. J. Winton (0), Nowra : Indian Runners	30	85	115	152	140	123	88	94	80	46	23	19	995	31	79/9
13. A. W. Hodson (1), Enfield : Indian Runners	10	58	108	100	137	123	128	123	67	13	38	53	958	32	82/3
14. R. M. Russell (1), North Bondi : Indian Runners	22	48	104	126	119	121	109	111	83	17	45	52	957	30	83/7
15. W. J. Wexted (1), Rozelle : Indian Runners	35	75	94	100	102	121	110	67	90	9	53	75	931	29	83/1
16. Hughes Bros (0), Teralba : Buff Orpingtons	23	56	98	145	113	123	100	96	68	3	39	32	896	32	79/2
17. S. Ellis (0), Botany : Cantonese	0	0	56	87	137	147	132	133	101	12	47	42	894	27	70/3
18. W. Broughton (1), Glenfield : Indian Runners	24	61	104	105	105	109	111	116	84	18	26	21	884	31	78/-
19. G. Cross (1), Curlewis : Indian Runners	5	14	60	111	149	142	117	102	73	32	37	20	862	33	70/4
20. T. H. Chapman (2), Botany : Indian Runners	32	40	47	69	108	115	106	128	96	15	48	31	835	29	69/-

Second-year Ducks.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Grand Total.	Weight per doz.	Total Value.
																oz.	
1. G. Rogers (1), North Ryde : Indian Runners	1220	81	142	123	97	139	188	149	127	122	58	25	43	1244	2464	32	239/-
2. J. Dunlop (2), Marrickville : Indian Runners	1235	65	105	122	116	138	126	148	80	79	57	23	25	1094	2329	31½	234/2
3. D. Salter (1), Wilberforce : Indian Runners	1092	58	134	141	98	101	147	133	110	68	36	4	45	1075	2167	33	217/-
4. G. E. O. Craft (2), Ingleburn : Indian Runners	1034	40	65	97	95	133	119	122	143	100	55	28	22	1019	2053	34	196/8
5. Hughes Bros. (0), Teralba : Buff Orpingtons	1105	73	61	77	85	116	127	103	120	86	3	0	31	882	1987	32	195/2

Comparison of Results.

The following compares the results in the whole series :—

THIRD-YEAR HENS.

	Eggs per Hen.			Value per Hen.		
	First Year.	Second Year.	Third Year.	First Year.	Second Year.	Third Year.
18 Black Orpingtons	207	156	125	21/10	18/4	12/2
6 Cuckoo Leghorns	205	168	124	20/9	19/10	11/3
6 Langshans	198	158	123	23/1	15/5	12/3
30 White Leghorns	210	153	106	22/4	17/3	8/10
Average cost of feed per head	.....	....	.. .	7/9½	6/9	5/8

SECOND-YEAR HENS.

	First.	Second.	Third.	Fourth.
Number of pens	40	50	40	40
Highest total, two years	2,487	2,624	2,319	2,369
,, ,, second year	1,054	1,150	1,013	1,045
Average per hen, first year...	180	179	190	194
,, ,, second year	124	127	140	134
Profit over feed per hen, first year . .	11/2	10/11	11/4	16/9
,, ,, ,, second year ..	6/0½	5/4¾	9/8	5/4
Greatest value of eggs, two years, per pen..	241 6	256/9	262/5	254/2

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
6 Brown Leghorns	208·1	166·5	25/-	15/9
6 Langshans	165·8	166·6	20/1½	16/10
186 White Leghorns	196·7	135·0	23/7	11/11
36 Black Orpingtons	183·3	126·8	22/1	12/-
6 Silver Wyandottes	206	88·3	16/6	9/6

NINTH ANNUAL COMPETITION.

	No. of Pens.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Price of Eggs.	Average Value per Hen.	Feed per Hen.	Profit over Feed.
1st ...	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd ..	100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	125/-	/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/6½	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	134/5	1/2	16/3½	6/1½	10/2

NINTH ANNUAL COMPETITION—*continued.*

	Eggs per Hen.	Value per Hen.
114 White Leghorns ...	185·1	18/0¾
18 Langshans	171·4	16/8
12 Brown Leghorns	157·7	14/10
30 Silver Wyandottes. .	155·5	15/2¾
6 Cuckoo Leghorns	150·6	14/11
48 Black Orpingtons	150·0	14/4
6 White Orpingtons	127·5	12/5
6 Minorcas	114·1	10/10

DRY *v.* WET MASH TEST.

	Number of Eggs.			Value.			
						Difference.	
	Dry.	Wet.	Difference.	Dry.	Wet	In favour of Wet.	In favour of Dry.
				s. d.	s. d.	s. d.	s. d.
Hillcrest P. F., White Leghorns	1,131	1,262	131	109 6	131 2	21 8	.....
D. Kenway, Black Orpingtons ...	1,008	1,119	111	104 3	118 8	14 5	......
C. C. Kennet, White Leghorns ...	990	1,128	138	96 8	116 2	19 6	......
Mrs. J. W. Cox, Langshans ...	954	973	19	96 8	87 8	......	9 0
J. J. McKenna, White Leghorns	920	1,171	251	93 7	110 6	16 11	......
S. Ellis, White Leghorns...	870	1,117	247	87 5	110 9	23 4	......
F. J. Brierley, White Leghorns...	856	1,268	412	84 7	128 9	44 2	......
R. J. Stuart, White Leghorns ...	830	1,052	222	77 1	101 5	24 4	......
E. Waldron, Black Orpingtons ...	734	950	216	70 5	86 5	16 0	......
L. L. Ramsay, Black Orpingtons	511	774	263	50 3	68 2	17 11	......
	8,804	10,814	2,010	870 5	1,059 8	198 3	9 0

	Dry Mash.	Wet Mash.
Total eggs laid	8,804	10,814
Average per hen...	146·7	180·2
Market value per hen	14/6	17/7½
Profit over feed, per hen ..	7/0¾	11/6

SECOND-YEAR DUCKS.

	First Year.	Second Year.
Highest total	1,235	1,244
Average eggs per duck... ...	189·5	177
Value of eggs per duck... ...	20/2	15/9
Cost of feed per duck	9/6½	10/-
Profit over feed, per duck ...	10/7½	5/9

FIRST-YEAR DUCKS.

	First Competition.	Second Competition.
Number of pens...	25	20
Winning total	1,235	1,278
Lowest total	507	835
Highest monthly total	177	166
Average eggs per duck... ...	156·5	170·5
Greatest value per pen	134/5	113/7
Average price of eggs	1/3	1/0½
Average value per duck ..	16/6	14/10½
Cost of feed per duck	9/6	10/-
Profit over feed, per duck .	7/-	4/10½

FARRER MEMORIAL FUND.

THE Farrer Memorial Fund has been practically closed, the Committee having succeeded in raising over £1,000. The following donations have been received since the last acknowledgment was made:—

		£	s.	d.
Gillespie Bros.	Sydney	10	0	0
Sir F. B. Suttor	do	2	2	0
Boree Creek Farmers' Union... ...	Glenara	2	2	0
Macleay A., H., and I. Association...	Kempsey...	1	1	0
Mr. Tiernan	Tharwa, Queanbeyan ...	8	14	0
Hon. Sydney Smith	Penrith	2	2	0

The amount now to the credit of the Fund is **£1,028 17s. 8d.**

COON BUGS AT YASS.

MR. F. A. RIDLEY recently forwarded specimens of bugs which had invaded the fences and trees at North Yass in countless numbers. Mr. W. W. Froggatt, Government Entomologist, identified the specimens as "Coon Bugs" (*Oxycarenus luctuosus*). The young larval forms are red, but as the insects grow the wings cover the red body, and they become black and white, and not so noticeable.

These bugs swarm in enormous numbers out west, covering the ground and fences; but they have not been recorded as doing much harm to vegetation, though allied to the "Rutherglen Bug," which is such a pest to field crops. They are not injurious to poultry or human beings. About a house or garden they could be destroyed in the larval state with kerosene emulsion.

The Vine in Australia.

M. BLUNNO, Viticultural Expert.

Introduction.

MUCH has been said and written at various times about the suitability of a large portion of the Australian Continent for vine-growing; and the writer, in many articles, and in the discharge of the duties connected with his official position, has reiterated what is well-nigh a platitude, that grape-vines can be profitably grown in many more districts besides those where they form an important industry at present. The possibilities in this direction have, as with several other Australian industries, hardly been tapped. If the expansion of viticulture in this country has not kept pace with the agricultural development of the continent, the reason is a complex one, being the result of concurring factors, such as racial tradition involving predilection for one rather than another occupation; and diet of the people, which is a matter of acquired taste, the taste itself being in turn the result of climatic conditions under which a race is bound to live.

Of all the great British dominions, Australia is the most purely British; and in the history of races no eugenics have yet achieved, within the span of three generations, a change in the art of living, necessary as it might be, if it is true that climate is one of the determining factors of diet. Vine-growing, in the open air at any rate, is not known, and would be impossible in the United Kingdom. Wine made from grapes cannot be produced there; so it cannot be a national beverage. Under these circumstances the viticultural industry could not appeal much to the average British settler in Australia, suitable as the pursuit might be for its climate. The British farmer excels in stock-breeding, and the renown of the Australian fleece is essentially due to the fine breed of sheep evolved. The Argentine, with a similar climate to this, is among the young countries second to Australia in the matter of output and quality of wool; and if great strides have been made of late, the British *estancieros* may well take the credit for it. But in Argentine the acreage under vines is by far larger than that of Australia, because the bulk of the population, coming from Latin countries, have carried with them their taste for the national beverage, and the *hijo del pais*, the native-born, has inherited the same taste. Happily for them the national beverage is suitable to the climate of the country.

In California viticulture is a far greater industry than in Australia. Its expansion and progress are due to the large communities of Italians and Swiss settled there. Californian wines are now competitors against foreign wines in the United States and Canada, and also to some extent on the

markets of Great Britain. In Australia, the Italians, French, and Germans, in proportion to their numbers, are more largely represented in the viticultural industry than the British population.

The first incentive to the production of an article of diet which can be profitably produced in the country is a large local consumption. The French output of wine in an average season is about 1,000,000,000 gallons, yet only 5 per cent. of the total money worth of that crop represents the wine that is exported, while 95 per cent. in value is consumed by not quite 39,000,000 Frenchmen. In an ordinary year about 800,000,000 gallons are produced in Italy, worth about £40,000,000. The wine exported to foreign countries represents about 2 per cent. of that sum, the other 98 per cent. representing the value of the wine consumed by 35,000,000 Italians. The output for the Commonwealth during 1908-9 was 5,500,000 gallons, of which 730,000 gallons, or about 13 per cent., was exported.

It is an uncontrovertible fact that wine-drinking races are prominent for their sobriety. Unhappily, France has somewhat lost the full privilege she once enjoyed of being one of the most sober countries. When the *Phylloxera vastatrix* swept through the French vineyards, and the wine output was reduced by two-thirds, wine became more expensive, and people took to strong spirits. Alcoholism followed, and is in evidence more in the north, where it is too cold for vines, and wine is more expensive, than in the south. Italy is still one of the most temperate countries. Drunkenness, with its attendant evils, is known only in those districts where but little wine is produced. The poorer class of those districts find in cheap spirits a cheaper substitute for wine. The point was tersely expressed by a cynical innkeeper, who, during a period of strike, and of consequent hardship, advertised his strong alcohol drinking shop as the "poor man's savings bank."

Of all the Italian provinces, the Venetia has the smallest area under vines. It is there that the largest number of dipsomaniacs are to be found, the proportion being 17 for every 100,000 inhabitants. A Bill is now before the Italian Parliament to regulate the drink traffic, licenses, &c. No restrictive measures against the sale of wines are included. All beverages containing up to 35 per cent. of proof spirit are considered wines. It is the sale of spirits that it is intended to check and control. While the output of wine in that country is now what it was in 1886, although the population has increased by 6,000,000, the production of alcohol has risen from about 2,000,000 to 13,000,000 gallons, and the cases of chronic alcoholism have increased in proportion. Many navvies who have been in the United States of America, in Russia, and in other countries where wine is not to be obtained at moderate price, continue in their native country the habit of spirit-drinking acquired in such places, and it is among them that the largest number of drunkards and consumptives are to be found.

The temperance crusade, that is being carried more or less through the world with the fervor of an apostolate, has a great humanitarian aim, and rises to the importance of a national movement; but the creed is far too

indiscriminate. The condemnation of alcohol under any shape or form, of strength or of dilution, and its confinement to the pharmacopœia, is a crusade that may finally defeat its own noble end.

Wine from grapes has in this country two enemies preventing it from becoming popular—strong spirits on one side, and on the other the strict temperance advocates, who should qualify themselves with a different adjective explaining their views more truly, and call themselves the abstemious party. The higher criminality of Latin countries has often been pointed out as an argument against wine-drinking, forgetting that the Turks and the Moslems in general are abstemious.

Australian dry wines contain from 11 to 15 per cent. of absolute alcohol by volume, corresponding to 19·3 and 26·3 respectively of proof spirit. Sweet wines, muscats, and wines of the port and sherry types, being fortified, contain from 17 to 21 per cent. by volume of absolute alcohol, corresponding to 30 to 37 per cent. of proof spirit.

The alcoholic strength of dry wines delivered for local consumption averages from 19·3 to 23 per cent. of proof spirit. The same dry wines with an amount of alcohol above 23 and up to 26·5 per cent. of proof spirit are by a misnomer generally called Burgundy, and represent the bulk of the export trade to England. Consequently, Australian wines of the dry types, which are sold under various names as clarets, hocks, chablis, &c., are not stronger than some of the best wines produced on the Continent of Europe.

Of course, wines are intoxicating, because to them also applies the common aphorism that one can have too much of a good thing. Many people are under the impression that wine, being a lighter alcoholic beverage, can be freely indulged in at any time of the day. The real wine-drinker is a temperate man, and he only drinks a little wine with his midday and evening meal; it is not true that wine-drinking races drink wine just as the British drink tea. It is, in fact, considered very bad form to drink wine between meals, and it is only among those of the working classes who are much inclined to conviviality that wine is generally partaken of on a holiday afternoon, after a game of bowls, or at a picnic; and even then it is usually taken to wash down solid food.

Two friends of mine, on a visit to Rome, entered a café one afternoon. Thinking the proper thing to do was what the Romans did, they asked for a bottle of the wine of the country. But as the café gradually filled with customers, much to their surprise they saw that the Romans all asked for coffee and soft drinks, and that they were the only two topers in the place. I had somewhat the opposite experience not long ago, when on a Sunday I went to a restaurant in this city for my dinner and found that customers were refused wine at any price, the law forbidding the drinking of wine in a place open to the public on the Sabbath day.

Taken as a whole, Australians are not *connoisseurs* of wines. Many think they have received good wine if they have paid a high price; others purchase wine and pay a moderate price, but the wine is not worth what they pay for it.

Others, again, hold the opinion that many Australian wines are adulterated, which is not the truth. Certainly some of them are unpalatable, but that defect is due not to adulteration, but to lack of knowledge in wine-making and keeping, which results in deterioration.

The most prevalent idea is that Australian wines are put on the market too new. The fact is that this country's wines are put on the market at a much older age than those of the truly wine-drinking countries. At least four-fifths of the wine produced in Italy, France, &c., is consumed the same year. In Italy, vintage begins about the second week in September, and by the 15th of October is pretty well over all through the country. In many districts it is an old custom to begin the sale of new wine for daily consumption on St. Martin's Day, which falls on the 11th November. In France they do not wait any longer.

It is generally believed here that new wines "go to the head" more than matured ones. Perhaps the reverse is the case, because old wines, apart from the same amount of alcohol, contain ethers, which form what is called the *bouquet* of the wine. On account of this, matured wines are more palatable and at the same time more stimulating. The real wine-drinker, however, does not look upon wine as a luxury but as an article of his daily diet. Be the diet as poor as imaginable—bread and onions or bread and cheese—a glass of wine is to him a necessary complement of that diet, because wine is a food.

The quality of Australian wines compares well with that of European wines grown in similar climates; and if vineyards were planted for wine-making in the colder districts of Australia, types of table wine other than those to which we are accustomed could be produced, so that the consumer would have a larger wine list to choose from to suit his individual taste. The wines of this country are already *known* in Europe, and although no Australian wine is imported into the large vine-growing countries of that continent (for, indeed, that would amount to taking coals to Newcastle), still they have been highly appreciated at various international exhibitions.

The United Kingdom is the natural market for the export of Australian wines, and there is already a promising future before the industry, for gradually the prejudice against them is disappearing owing to the energetic advertising campaign undertaken by one or two pioneering firms. The consumption of wine in England is about 15,000,000 gallons per year, the bulk of it being high-priced wines. France, Spain, Portugal, and Germany are the continental countries which are the principal suppliers. The extent of the territory in Australia over which vine-growing for profitable wine-making is possible is so large that conditions of climate and soil can be found quite similar or equivalent for the production of the like types, and there is no reason why at least a large proportion of that trade could not be captured.

But the upper class of British at Home still look askance; and I remember one afternoon in August, 1903, when having afternoon tea on the verandah of the British House of Commons, a gentleman prominent in politics, who it is said "discovered the Colonies," questioned me as to my genuine opinion of

Australian wines. I expressed it in very favourable terms, and was supported by some Members of Parliament, who could not see why Australian wines should not be as good as others. The statesman who had "discovered the Colonies" was very pleased at my unreserved praise of the wines of this country, and said, "You know, sir, I like the Colonies"; and turning to the others he suggested that it would be a brave host indeed, and one imbued with truly imperial spirit, who would defy prejudice and put before his guests at a dinner party a bottle of Colonial wine.

In the popular imagination wine-drinking is associated with gout and rheumatism. If there were any semblance of truth in it, then the Italians, with 22 gallons, and the French, with 26 gallons per head per annum, would be nations of cripples; and in those countries a very important industry of manufacturing crutches would be associated with the wine industry. Port wine, so greatly in favour in England not many years ago with the lord, the squire, the judge, the financier, is associated with high and good living, and is not wrongly suggestive of corpulence, rubicund noses, swollen toes, spasmodic pains, and attendant fits of cantankerous temper. But the man who is a heavy drinker of port and allied wines is not a "wine-drinker" in the accepted sense of the term; he is a man who has a craving for alcohol and takes it under a tastier and more aristocratic form. A regular and abundant meat diet, washed down by a quart bottle of port daily, must be conducive to disorder of health. "Wine-drinkers" take only light, dry wines, a moderate potation of them being part of their midday and evening meals. In wine-drinking countries, women, too, take their share with the men, and it is not the habit of the gentler sex to rise after dessert and "leave the men to their wine." After fruit comes the coffee, and there is an end to wine-drinking for all, women and men. Navvies, agricultural labourers, artisans, all drink wine, and this helps to make up for the often scanty or not sufficiently nutritious rations. Wine reduces the body's waste consequent upon fatigue and over-exertion; and several physiologists say that "wine is the savings bank of the body."

The geographical isolation of Australia, and in particular her great distance from the continents peopled by white races, are the reasons why in this country certain prejudices die hard; why the experience of other countries does not appeal to the masses, who naturally cannot know. On one side are large vested interests in the traffic of strong drinks; on the other a militant party of well-meaning gentlemen who condemn all alcoholic beverages. Between the two extreme tendencies, the spirit of compromise of the British people, the *via media*, which is the track safe from pitfalls, should appeal to common-sense, and determine people to acknowledge that wine-drinking, as explained in the foregoing, has a strong case in its favour.

(*To be continued.*)

Agricultural Bureau of New South Wales.

Bathurst.

Mr. Peacock, the Manager of the Bathurst Experiment Farm, lately delivered a lecture to the members on "Dry Farming, as Practised in South Australia."

A Veterinary Surgeon will give a lecture to the members, in the Technical College Hall, at 8 p.m., on Tuesday, 15th August, on "The Treatment of Wounds and Colic in Horses."

Carlingford.

The members of this branch recently visited the Departmental orchard at Dural, and have favoured the Department with criticisms of the operations now being conducted there. An offer has been made for the Fruit Expert to meet the members at the orchard, so that the Department's methods and intentions might be fully explained.

Mr. Bryant, the Assistant Fruit Expert, delivered a lantern lecture on "Pruning," on the 2nd June.

Inverell.

A pruning demonstration was given by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 7th June, at Mr. Jenkins' orchard. There was a large attendance, including about 80 school boys from the neighbouring schools.

A Veterinary Surgeon will deliver a lecture on "Conformation and Unsoundness of Horses," at 8 p.m., on Monday, 14th August.

Jiggi (Richmond River).

A branch is being formed here, and residents in the district who wish to join should communicate with the hon. secretary, Mr. D. Gibson, Daru Farm, Jiggi.

Little Plain.

Mr. McDonald, Inspector of Agriculture, will lecture to the members of this branch on the 6th July.

An endeavour will be made for a pruning demonstration, to be given some time in August.

Nelson's Plains.

A branch of the Bureau has been formed at this place, with Mr. Michael Markham as Chairman; Mr. James Saunders, Vice-Chairman; Mr. Jack Pillidge, Treasurer; and Mr. V. Schlaadt, Secretary. Already twenty-four members have been enrolled, and the annual subscription has been fixed at 5s. for one member of a family. Should a second member of the same family join, he will pay 2s. 6d.; and should more than two members of a family join, then one person pays 5s., and each of the others pay 1s. 6d. per annum. This scale of payment has been arranged to encourage farmers' sons to join.

Parkes.

Mr. Bryant, Assistant Fruit Expert, gave a pruning demonstration on 20th June, at Mr. Kendall's orchard. There was a large attendance of district fruit-growers.

At a recent meeting of the branch Mr. H. P. Miller gave an address on "Bunt," a report of which appeared in the local papers.

A veterinary lecture will be arranged for some date in September.

Walla Walla.

The monthly meetings of this branch are regularly held, and the membership has increased to forty. At a recent meeting Mr. A. J. Wenke, who is one of the most progressive farmers in the district, gave a lecture on "Viticulture," which has been very favourably noticed in both the country and metropolitan press.

An endeavour is being made to arrange for a pruning demonstration during the month.

Walli.

Mr. Mathews, the Sheep and Wool Expert of the Department, delivered the first of a series of lectures and demonstrations on the 1st June. There are about forty members who have intimated their intention of attending the full course. Some farmers travelled over 20 miles in order to be present at the lecture.

Yass.

At a recent meeting the subject selected for discussion by the members was "Soils of the district and their productions." Samples of soil were shown, and the preparation for sowing and cultivation of crops were fully discussed. Mr. P. Magennis, of Bloomfield, gave an interesting address on the cultivation of rape and its feeding properties. He advised harrowing directly after ploughing, and rolling after sowing. Shallow sowing gave the best results. Land that will produce good maize crops will yield well with rape. His experience ranged over a number of years, and in his opinion rape as a fodder had no equal. Sown early in May, stock could be turned on it and kept on until early in December. Twenty-two acres sown early in July last year kept 320 sheep from September to December.

Thirty-seven members have joined the branch.

The Sheep and Wool Expert of the Department will give a series of lectures on the 15th June, 27th July, and 24th August, and over fifty persons have signified their intention of attending.

Veterinary Lectures.

Advices have been sent out to the various branches, asking that arrangements be made for the Veterinary Surgeons of the Department to deliver lectures as follow:—

5 July	...	Gilgandra.	8 Aug.	...	Cowra.
6 ,,	...	Jerilderie.	9 ,,	...	Canowindra.
7 ,,	...	Berrigan.	14 ,,	...	Inverell.
7 ,,	...	Coonamble.	15 ,,	...	Bundarra.
11 ,,	...	Peak Hill.	15 ,,	...	Bathurst.
13 ,,	..	Trangie.	16 ,,	...	Barraba.
13 ,,	...	Macksville.	17 ,,	...	Manilla.
17 ,,	..	Port Macquarie.	22 ,,	...	Mudgee.
17 ,,	...	Denman.	23 ,,	...	West Wyalong.
18 ,,	...	Merriwa.	24 ,,	...	Tamworth.
19 ,,	...	Taree.	28 ,,	...	Armidale.
19 ,,	...	Wagga.	29 ,,	...	Guyra.
25 ,,	...	Coonabarabran.	30 ,,	..	Glen Innes.
27 ,,	...	Boggabri.	30 ,,	...	Gundagai.
27 ,,	...	Wellington.	31 ,,	...	Tumut.

Department of Agriculture,
Sydney, 3rd July, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

GUERNSEYS.—Duke of France: sire, King of the Roses (imp.); dam, Rohais Lassie II (imp.); calved 8th August, 1910; colour, lemon and white. Price, **£45.**

Lancaster: sire, King of the Roses (imp.); dam, Shamrock of Illawarra (imp.); calved, 27th August, 1910; colour, lemon and white. Price, **£45.**

HOLSTEIN.—Kiel: sire, Hollander; dam, Lolkje Zuyder Zee; calved 22nd May, 1910; colour, black and white. Price, **£25.**

SHORTHORNS.—Royal Pansy: sire, Royal Hampton X (imp.); dam, Australian Pansy; calved 8th December, 1909; colour, red roan. Price, **£50.**

Australian Pansy is by Airy Knight II from Pansy IV (imp.).

Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRE.—Dado: sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—*Adonis: sire, Prince Souvia; dam, Beauty of the Brickfield (imp.); calved 10th November, 1910. Price, **£45.**

***Lord Hopetoun:** sire, Parson's Hope; dam, Souvenir of Wollongbar; calved, 24th October, 1910. Price, **£45.**

***Romulus:** sire, Prince Souvia; dam, Rosey VII (imp.); calved, 31st August, 1910. Price, **£45.**

JERSEYS.—*Maro: sire, First Choice; dam, Marjory Newman; calved, 27th August, 1910. Price, **£20.**

***Oceanus:** sire, First Choice; dam, Seaweed; calved 12th August, 1910. Price, **£20.**

First Choice is by Melbourne from Lady Tidy (imp.).

AYRSHIRES.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown. Price, **£15.**

***Lord Russell:** sire, Lucky Getter (imp.); dam, Belladonna of Russelly; calved 18th June, 1910. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS FOR SALE.

GRAFTON EXPERIMENT FARM.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£
Milkmaid ...	His Worship ...	Dairymaid II ...	6 July, 1905 ...	25
My Love ...	The Judge ...	Her Loveliness ..	19 March, 1904 ...	25

H. C. L. ANDERSON,
Under Secretary.

* Applications for these bulls will be held till 21st July. If more than one application be received for any one bull, his disposal will be decided by ballot.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ...	Pansy 4th (imp.).		
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Hampton 10th (imp.).	Soliman ...	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ..	Berry Farm ...	*
Guernsey ..	Gentle Prince ...	Rose Prince (imp.).	Gentle (imp.).	Trevallyn... ...	20 Sept., '11.
,, ...	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Lismore	20 Nov., '11.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Dunoon	1 Dec., '11.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	12 April, '11.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	30 Dec., '11.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Nov., '11.
,, ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	,, ,,	19 Dec., '11.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Berry	25 Aug., '11.
,, ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Singleton	22 Oct., '11.
,, ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	Berry	*
,, ...	Royal Preel ...	Otchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 Nov., '12.
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry	*
Ayrshire ..	Don Juan ...	General (imp.)...	Judy 9th (imp.)	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince ..	Rosie 5th ...	Grafton Farm ...	*
,, ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ...	Jamie's Ayr ...	Jamie of Oakbank.	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.).	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Orchard Notes.

W. J. ALLEN.

JULY.

Bitter Pit.

THIS is a very live subject, and many of our fruit-growers are anxious that experiments which the Government purpose carrying out should be started with as little delay as possible so as not to lose a season. Dr. Jean White, of the University of Melbourne, has made a start in the investigation of this trouble, but it is not considered that the cause has as yet been solved. However, in the concluding remarks of her report on this subject, Dr. White has suggested that fruit-growers who are growing varieties which are affected with this pitting, should themselves experiment by leaving a number of trees unsprayed, in order to find out for themselves whether the sprayed are worse than the unsprayed trees. There are several other experiments which may be tried, among which are liming; watering a few trees in order to keep up a good supply of moisture; drainage; spraying trees with lime and sulphur solution about the time they are breaking into blossom; and in pruning, keep them well opened out so that all the fruit has plenty of light and sunshine. A too dense growth or too much shade should not be encouraged after the tree has commenced to bear.

Mr. W. A. O'Neil, of "Hill View," Cowra, states that he has five Cleopatra trees which were all affected by Bitter Pit this season, though they have never been sprayed with any solution whatever.

Wherever varieties are found to be affected from year to year, no time should be lost in either grafting or budding such to the best export varieties which are supposed to be fairly free from the trouble.

Grafting and Budding.

Grafting may be done in the spring, just when the buds begin to swell; or budding in the fall, while the bark raises readily. If it is desired to bud in the spring, scions with well developed buds may be cut this month from picked trees which have borne good fruit. Place these in cold storage, where they may be kept until the young trees are ready to bud in the spring, when they may be inserted. As soon as it is discernible which have taken, the branch may be cut back, when it will be found that these buds will soon make a growth, and will then need to be tied to a stake in order to prevent their being blown off.

In budding, it is well to put in plenty of buds, so that if a few do not take there will be enough left from which to start the new top. The bud should always be inserted about where it is desired to have a branch. This will ensure a well-formed tree, which should carry some fruit the second year. All cuttings for grafting should be heeled in the ground in a cool damp place.

Planting.

Where orchards are to be planted, the land should be in readiness to plant citrus fruits, as well as apples, pears, &c. The latter trees should be put in this month, while the citrus trees may be planted either at the end of August or early in September. In cold late districts only plant varieties of apples and pears suitable for export.

Refills.

All refills other than citrus fruits should be planted with as little delay as possible now.

Pruning.

The most important work during this month is the pruning, which must be pushed on as fast as possible now, so that it will be completed and the ground well ploughed while it is still moist. Each and every tree has its own individuality, and, therefore, the grower should study the habits of the different trees, and prune them in such ways as will ensure that they will return him the best fruit from year to year. Both old and young trees are full of fruiting spurs and buds this season, and, therefore, the grower will be justified in removing more wood than usual this pruning, in order to prevent his trees from overloading. Weak trees may have their leaders well shortened back. Burn all prunings as soon as possible. The most expeditious way to accomplish this is to mount an old tank on wheels with grating in bottom.

While pruning or working around the trees, always keep a sharp lookout for any diseases which are liable to attack them, and mark any tree so affected.

Apply stable manures this month.

Citrus fruit handling, packing, and marketing are continued this month.

Scrape and burn loose bark from apple, pear, and quince trees

Orchards should be kept in thorough order from 1st August until 1st April each year.

I have to acknowledge receipt of specimens of fruit during the past month from the following growers:—

A very fine collection of oranges was received from Mr. Charles Franks, of Carlingford, comprising Washington Navels, Thompson's Improved Navels, Buckeye Navels, and Navalencias. The last-named fruit was the product of imported trees.

Specimens of Washington Navels, grown under irrigation, received from Mr. A. Wurfel, of Dubbo, were of excellent quality, and fully demonstrated what can be done by irrigation in our back country.

Fumigating Citrus Trees.

Mr. R. E. Peck, of Kurrajong, writes that he prefers winter fumigation. He then uses No. 2 Table with, he claims, the very best results. He says he can proceed with the work in the daytime, and can then operate more easily than at night, and with no more likelihood of damaging the trees.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Hay P. and A. Association	G. S. Camden	July 11, 12
Trangie P. A. and H. Association	J. E. Reynolds	,, 12, 13
Wentworth P., A., and I. Society	W. B. Crang	,, 19, 20
Deniliquin P. and A. Society	L. Harrison	,, 20, 21
Peak Hill P., A., and H. Society	A. Yeo	,, 26, 27
Condobolin P., A., H., and I. Association	A. Turner	Aug. 1, 2
Narrandera P. and A. Association	W. T. Lynch	,, 2, 3
National A. and I. Association, Brisbane, Queensland	C. A. Arvier	,, 7–12
Bogan Gate P. and A. Association	B. M. Lowing	,, 8
Trundle P. and A. Association	L. Todd	,, 10, 11
Corowa P., A., and H. Society (Annual Show)	J. D. Fraser	,, 15, 16
Forbes P., A., and H. Association	J. H. Bates	,, 16, 17
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 22, 23, 24
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 22, 23, 24
Parkes P., A., and H. Association	G. W. Seaborn	,, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 29, 30
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton	,, 29, 30, 31
Grenfell P., A., and H. Association	G. Cousins	,, 30, 31
Young P. and A. Association	G. S. Whiteman	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys	,, 6, 7
Ariah Park P., A., H., and I. Association	J. N. Taylor	,, 6, 7
Cowra P. A. and H. Association	J. T. Martin	,, 12, 13
Barmedman A. and H. Association	P. H Sheahan	,, 13
Cootamundra A., P., H., and I. Association	T. Williams	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith	,, 13
Canowindra P., A., and H. Association	G. Newmon	,, 19, 20
Temora P., A., H., and I. Association	W. H. Byrnes	,, 19, 20, 21
Henty P. and A. Society	H. L. Yates	,, 26, 27
Ganmain A. and P. Association	J. H. Ashwood	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther	Oct. 4
Hillston P. and A. Association	S. I. Gordon	,, 19
Lismore A. and I. Society	T M. Hewitt	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd	,, 8, 9

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser	,, 17, 18
Kiama A. Association	R. Somerville	,, 26, 27
Berry A. Association	C. W. Osborne	Feb. 7, 8
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Dapto A. and H. Society	J. H. Lindsay	Mar. 1, 2
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	,, 7, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28

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VOL. XXII. PART 8 AUGUST 2, 1911.

Agricultural Gazette of New South Wales.

Sheep and Wool for the Farmers.

THE QUESTION OF MUTTON.—THE RAISING OF THE EARLY LAMB.

J. WRENFORD MATHEWS.

Early Maturing Breeds.

EARLY maturity and uniform body development are the great requirements here, and we turn our attention to the breeds that possess those characteristics in a more or less marked degree. Two points call for decision: Which breeds best maintain and transmit these characteristics, and what factors govern the relative fleece and early-maturity values of the different strains.

From the necessities of the aim and scope of these articles, we have been compelled repeatedly to refer readers to earlier papers of the series, in order that they might get the mental background essential to a full appreciation of the further development of this important and interesting subject. We must do so again in this place. The system of classification set forth in the August, 1910, number of the *Gazette*, clearly, and, it is to be hoped, finally differentiated the essentially wool from the essentially mutton breeds. It is upon this system of classification that all subsequent discussion of wool and mutton sheep must be based. The fact that it is, and will be, the foundation of both the experimental and instructional work of the Department in sheep and wool, requires that it be thus strongly emphasised.

The various breeds of sheep fall naturally into three clearly distinct groups—The Merino, the Long-wools, and the Downs. For the special characteristics of the two former groups we must again refer the reader to other papers. It is from one or other of the Down breeds that the most valuable type of early maturing lamb can be evolved, and it is with the Down breeds, therefore, that we are now specially concerned. The Down breeds comprise South Down, Shropshire, Hampshire, Oxford Down, Suffolk, and Dorset Horn.

Since they possess a compact body, and short harsh wool, the Downs have been called, in contrast to the larger frames, and long, coarse, lustrous fleeces of the Long-wools, the "Short-wool" breeds. This is not a very suitable term. It is correct so far as it goes, but it is misleading in that it does not go far enough. The difference in the wool is only the beginning of differences. In contrasting the original British breeds, the Lincoln and the South Down, we see differences more striking than are generally met within the limits of a single species. The Lincoln is long and gaunt, with the bone large and prominent; the South Down is smaller boned, and in all respects splendidly proportioned. This accounts for the fact that the South Down

Dorset Horn-Merino 2-tooth.

Average live weight of body at sixteen weeks—78 lb 3 oz

Average live weight of body at seventeen months—114 lb 10 oz

Dorset Horn-Border Leicester-Merino. 2-tooth.

Average live weight of body at sixteen weeks—80 lb 9 oz

Average live weight of body at seventeen months—125 lb 8 oz

Dorset Horn-Lincoln-Merino. 2-tooth.

Average live weight of body at sixteen weeks—84 lb 12 oz

Average live weight of body at seventeen months—124 lb

CROSS-BRED SHEEP, WAGGA EXPERIMENT FARM, 1910.

yields the maximum quantity of prime mutton, and at the same time the minimum amount of bone, of any sheep in proportion to its total body weight. Moreover, the South Down yields a class of mutton which, in contrast to the coarse, tallowy flesh of the Lincoln, is of the finest texture and sweetest flavour. The natural tendency of the South Down and its derivatives is to lay on flesh and mature rapidly, while the Lincoln is a much slower maturer.

The character of the fleece, though, as already stated, not the only difference between the Long-wool and the Down, is yet a very significant difference. The wool of the Lincoln, as has been already pointed out, is characteristically long and lustrous; that of the South Down is short, and fine in diameter of fibre. In consequence of its heavy lock and length of staple, the Lincoln can produce upwards of 30 lb. of wool. The loose, open fleece of the South Down may reach at most about one-sixth of that quantity. Lincoln wool may be a foot or more in length; South Down seldom exceeds 2 inches. Though the diameter of its fibre is considerably greater than that of the South Down, yet the Lincoln wool possesses greatly increased length in proportion to its increased diameter, and the Lincoln is relatively much more valuable, since it possesses all the characteristics of a true wool sheep. The wool of the South Down, though naturally of finer diameter, is nevertheless deficient, as compared with other wools of equal fineness, in those qualities which would have given it a valuable texture.

In this connection it may be instructive to institute a comparison with the wool of an extreme early maturer, such, for instance, as the Dorset Horn. By contrast with the Lincoln and closely allied types, the Dorset Horn, while retaining all the desirable qualities of an early maturing mutton breed, is, nevertheless, an even poorer wool sheep. In proportion to its total body weight it yields the lightest fleece of any, and this fleece is conspicuously deficient in character, even as compared with the South Down, Shropshire, and Hampshire. It certainly claims purity of colour of fleece, there being no grey fibres and dark points as are found on the legs and face of other Down breeds. But its harsh and comparatively straight-fibred fleece is somewhat longer, and consequently coarser, than in any of the foregoing breeds. Still, its heavy and rapidly maturing body somewhat compensates for the deficiency in other respects. The body weight of a mature Lincoln would average from 160 to 180 lb., though animals outside those limits are common enough. The Dorset Horn, at a much earlier age, would possess a total weight of 200 lb. and over. Such a Dorset Horn sheep would yield approximately 6 lb. of wool. A Lincoln, much lighter in body, would yield from 20 to 30 lb., or more, according to type.

The following table of weights, showing the wool and mutton-producing capabilities of the different breeds, will probably be of interest. It gives a record of fair average specimens of the breed in each case. It has been found necessary to discriminate between high-class stud sheep and the ordinary flock types, and two sets of figures have therefore been prepared. The figures given afford a fair indication of the relative merits of the various

breeds, and it is only where trueness to type has not been maintained that the relative proportions vary to any considerable extent.

TABLE I.—Showing proportionate weight of fleece to that of body, yielded by the different types of British breeds.

Breed.	Fair average Stud Sheep.		Average Ordinary Flock Rams.	
	Body.	Fleece.	Body.	Fleece.
Long-wools.	lb.	lb.	lb.	lb.
Lincoln	180	28½	168	17
Leicester	200	16	160	14
Border Leicester	208	12½	185	10
Short-wools.				
South Down	143	6	140	5
Shropshire	192	11	180	11
Hampshire	188	10	177	8
Suffolk	204	9	186	6½
Dorset Horn	206	8½	196	6

The weights given are those of sheep from two to three years old, and the weight of fleece is the twelve months' growth.

This contrast of the relative merits of these various breeds, and the proportion it shows between weight of body and of fleece respectively, enables us to form a fairly correct estimate of the distinct characteristics of each. We are thus able to decide upon a more reliable basis the use to which each individual animal should be put in accordance with its suitability for the production of wool or mutton. If, for example, the South Down and Dorset Horn, representing minimum and maximum early maturity of those included in the mutton group, can only produce, say, from 6 to 7 lb. of wool, and that wool lacks the character necessary for conversion into any but the commoner articles of manufacture, these breeds cannot be profitably maintained except for their own special purpose.

The accompanying table of results of experiments carried out at the Wagga Experiment Farm will no doubt throw considerable light on the subject. Here the breeds have been grouped according to their wool and mutton values, and the character indicated by showing the weight of body and fleece in the different crosses. This information is supplemented by particulars of the girth, waist, and length measurements, as well as of the quality and length of staple of the fleece. The table embodies the results of work done at Wagga during 1909. The sheep were kept under the same conditions, and the results are very conclusive. Grouped according to age, the results are quite consistent.

The breeds used on this occasion have served to contrast slow maturity and extreme early maturity. The main points for the farmer's consideration are whether 124 lb. body weight in the Lincoln is as valuable as 136 lb. body weight in the Dorset Horn—both being at the 4-tooth stage—when the 15 lb. 12 oz. of the Lincoln's fleece are compared with the 9 lb. 7 oz. of wool produced by the Dorset Horn.

A similar comparison between these sheep at the 2-tooth stage will serve to emphasise the consistency of the results with the laws of breed and early maturity, which form primary considerations in all systems of breeding. For example, if the Lincoln-Merino wether be contrasted with the Dorset Horn-Merino wether, it will be seen that the 18 lb. difference in weight at seventeen months (2-tooth stage) has decreased to 12 lb. a year later. Furthermore, the second crosses show how considerably the employment of the cross-bred ewe (first cross) has increased the body-weight.

It is interesting to compare the wool produced by the Lincoln and Border Leicester-Merino crosses with tables showing the average proportionate lengths of staple relative to quality published in a preceding article.

TABLE II.—CROSS-BREEDING EXPERIMENTS WITH SHEEP AT WAGGA EXPERIMENT FARM.

Showing relative wool and mutton-producing qualities of the crosses obtained by mating different breeds.

Breed.	No. of Sheep.	Age.	Body.				Fleece.		
			Weight.	Measurements.					
				Girth.	Waist.	Length.	Weight.	Length.	Quality.
		months	lb. oz.	in.	in.	in.	lb. oz.	in.	
FIRST CROSS.									
Wethers.									
Lincoln-Merino	3	17	107 13	36	39	32	12 8	5½	46s–50s
Border Leicester-Merino ...	4	17	113 12	37	42	33	10 11	5¼	50s–56s
Shropshire-Merino	1	17	103 0	36	39½	29½	10 8	3½	50s
Dorset Horn-Merino ...	5	17	125 4	38	41½	34	7 3	3	56s–60s
Ewes.									
Lincoln-Merino	10	17	96 9	34	37	31½	11 4	5¾	46s–50s
Border Leicester-Merino ...	12	17	98 1	35	37	32	9 7	4½	50s–58s
Shropshire-Merino	4	17	101 14	34	38	31	10 5	3½	50s–56s
Dorset Horn-Merino ...	10	17	102 6	35	39	33	7 2	3	56s–58
Wethers.									
Lincoln-Merino	4	29	124 12	38½	40	31½	15 12	5¾	44s–46s
Border Leicester-Merino ...	5	29	129 4	39½	41½	34½	11 12	6	46s–50s
Dorset Horn-Merino ...	4	29	136 14	40	43	35	9 7	3¼	50s–56s
SECOND CROSSES.									
Border Leicester-Lincoln-Merino	7	17	127 4	38½	41½	34	10 14	6½	44s–50s
Shropshire-Lincoln-Merino..	7	17	115 1	37	40	33	11 12	4	50s–56s
Shropshire-Border Leicester-Merino	2	17	123 10	38	41	34	11 12	4	50s
Hampshire-Lincoln-Merino	7	17	109 6	38	41½	31	10 5	3½	50s–56s
Dorset Horn-Lincoln-Merino	4	17	135 0	39	43	35	8 5	3½	50s–56s
Dorset Horn-Border Leicester-Merino	3	17	134 0	38	43	34½	9 8	4½	46s–50s
Border Leicester-Lincoln-Merino	5	29	140 9	44	46	33½	12 9	6	44s–46s
Shropshire-Lincoln-Merino	4	29	129 1	43	44	32	11 3	3½	50s–56s
Dorset Horn-Lincoln-Merino	6	29	148 13	42	45½	34	9 4	4	46s–50s

Mutton Breeds available.

South Down, Shropshire, Hampshire, Oxford Down, Suffolk, and the externally distinct yet typically identical Dorset Horn, are named in order of increasing early maturity and body-weight. It is difficult at this stage to state definitely whether the Dorset Horn or the Suffolk is the earlier maturer. Under average dry Australian conditions the Dorset Horn has certainly shown to advantage, in which case it would probably be found to mature earlier than the Suffolk. As the table shows, the results of the Wagga experiments indicate superiority of the Dorset Horn over other breeds in weight of body and early maturity. This superiority is further borne out by the experimental work in cross-breeding at the Roseworthy Agricultural College in South Australia. This shows the suitability of the Dorset Horn under Australian conditions, since both institutions are situated in moderately dry areas.

In the "old country," the Suffolk is prized as an extreme early maturer. With the English farmer it ranks as one of the most popular and profitable of breeds. Australia can already provide a wide choice of breeds, yet the Suffolk is too valuable a mutton type to be entirely overlooked. The increased demand of our local markets for an early lamb affords an opportunity for turning the special qualities of the Suffolk to advantage in the direction of supplying this local demand.

It is interesting and instructive to contrast the Suffolk with the breeds probably more recently evolved from the South Down. The Suffolk's presence among Short-wool mutton breeds serves to illustrate how commercial enterprise has called into existence new and comparatively artificial types of live stock intended to meet large specific demands. Between the South Down and the Suffolk there exists a wide difference in frame, flesh, and conformation. The South Down, short and compact, the "old original" variety, famous for its high-grade flesh, supplies the extra prime mutton for which the wealthier classes are always prepared to pay top prices. The Suffolk, coarser-natured and more prolific, provides the earlier lamb and the mutton of the householder, to whom the price of meat is a consideration. These breeds illustrate how commerce advances with the science of agriculture, and how the consumer can be supplied according to his requirements and his means.

The Oxford and several other Down breeds, though valued in their native country, have never so far attracted any serious attention from Australian breeders. The Hampshire is kept in Australia to some slight extent, but, while a fairly useful breed, it has not received much support. As tested at the Wagga Farm it showed fairly satisfactory results. It is somewhat coarse-boned compared with the South Down and Shropshire. The head is large—much larger than in either of the two mentioned, and larger than the Dorset Horn as well. In brief, then, only the South Down, Shropshire and Dorset Horn call for any extended discussion.

The Down Sire.

What are the chief considerations to be taken into account in the choice of the Down sire? The question must be worked out on a commercial basis, determined by the probable value of the lamb at, say, five months. The question resolves itself into three factors—(1) quality of flesh; (2) size and equal conformation of body; and (3) early maturity.

The smaller carcase and slower maturity characterising the South Down must be measured against the larger body and increased early maturity of an extreme early maturer like the Dorset Horn, or that intermediate development of those qualities which associates the Shropshire with these breeds.

In order to maintain a dual-purpose combination, these breeds should be mated with Long-wool cross ewes. In making his choice of the Long-wool cross, the farmer must decide whether the earlier maturity and lighter but finer fleece of the Leicester and Border Leicester will compensate him for the loss in weight of fleece involved in the rejection of the Lincoln. Whether this earlier maturity exercises any appreciable influence on the period at which the lamb reaches a marketable size, is a matter that must await fuller investigation.

To consider a former statement from a somewhat different aspect, the breeder must decide whether the finer quality and later maturing lamb resulting from the union of the cross-bred ewe with the South Down will pay him better than the larger-bodied and more rapidly maturing lamb from the Suffolk or Dorset Horn sire.

The Weight of the Lamb.

As regards weight, the present preference is apparently for a lamb carcase scaling from 30 to 38 lb. An even weight of 35 lb. usually commands a higher relative price than a carcase of from 40 to 50 lb. The lighter carcase is usually graded as "first quality." Such carcases should be plump, rounded, and the fat evenly distributed through the flesh, and not excessive in amount. The fore-quarter should be full, and the leg short and well-filled, both on the inside and outside. The carcase should not be too long; the short, compact, square-shaped carcase is preferred to any other sort. The ideal carcase is one that will yield the maximum quantity of flesh and the minimum quantity of bone. The more nearly a carcase fulfils these conditions the higher the price it will fetch.

The South Down type of cross-bred early lamb answers somewhat closely to this description. But the South Down is a rather slower maturer. A South Down ram on a Lincoln-Merino ewe would produce a lamb that could scarcely be marketed before five and a half months, and this slower development must always be taken into account. The Shropshire, as the position assigned it in the Short-wool group indicates, is somewhat earlier in maturity, and when placed on a similar type of ewe, should produce a lamb sufficiently well forward to be disposed of, say, at from four and a half to five months.

Neither of these breeds, however, can compare for early maturity and body-weight with the Suffolk and Dorset Horn. But the mutton of those coarser-natured breeds is correspondingly less valuable. Still, when mated with abundant milk-producing ewes, their progeny would be ready for market at, say, from four to four and a half months. Their condition, as is always the case, would vary according to the season, the strain of ram employed, and, perhaps, still more largely the supply of suitable feed. So that in estimating the commercial value of the progeny of the different Down sires, the farmer must decide whether the slower maturing South Down is as profitable as the heavier-bodied and earlier but coarser-fleshed lamb from the Shropshire, or in a more marked degree the Suffolk or Dorset Horn ram. Every encouragement should be given the man who breeds for quality, but probably the Dorset Horn offspring would be the more profitable in the open market, provided that no great difference existed in the value of its mutton as compared with that of South Down strain.

Where rotation of crops is practised, a month's earlier maturity in the lamb is often a decided advantage. Frequently the farmer finds it advisable to plough in a section of the farm for the succeeding wheat crop before harvesting takes all his attention. The month saved is in this case an important consideration, as, although the carrying capacity is reduced, the ewes can have the benefit of all available feed, and so regain condition after rearing the lambs, before they are required for the succeeding year's mating. Moreover, under Australian climatic conditions it might often be necessary, owing to a threatened dry spell and the resulting shortage of feed, for the whole year's drop to be got rid of as promptly as possible. In such a case a month saved in the age of the lamb would probably mean for the year's transaction all the difference between profit and loss.

The following table shows the respective weights of lambs of different crosses, as the results of the experiments which have been carried out at the Wagga Farm during the year 1909 :—

TABLE III.—Showing average live weights of lambs, as a result of different crosses, taken at the age of sixteen weeks. The results cover a portion of the work done at the Wagga Experiment Farm during the year 1909.

Breed.	No	Weight.	Breed.	No.	Weight.
FIRST CROSSES.		lb. oz.	SECOND CROSSES.		lb. oz.
Lincoln-Merino	7	68 14	Cotswold-Lincoln-Merino ..	7	64 6
Cotswold-Merino	7	69 14	Border Leicester-Lincoln-Merino	7	71 9
Border Leicester-Merino ...	7	71 9	Cheviot-Lincoln-Merino	7	56 7
Cheviot-Merino	7	49 8	South Down-Lincoln-Merino ...	7	71 15
South Down-Merino	7	62 10	Shropshire-Lincoln-Merino ..	7	78 13
Shropshire-Merino . ..	7	64 7	Hampshire-Lincoln-Merino ...	7	73 3
Hampshire-Merino (12 weeks)	5	47 3	Dorset Horn-Lincoln-Merino ...	7	84 12
Dorset Horn-Merino	7	78 3			

Fair average specimens of some of these crosses are shown in the illustrations which appear in this and earlier issues.

A Practical Test.

Since the foregoing portion of this article was written, a valuable return has come to hand. With a view to obtaining full and reliable information as to the relative mutton values of these various crosses, the Department of Agriculture some months ago placed on the London market a consignment of lamb carcases. These lambs, 221 in all, were raised at the Wagga Experiment Farm, and comprised, with a few exceptions sold locally, all the lambs reared at that Farm last year. The breeds represented were South Down, Shropshire, Hampshire, Dorset Horn, and Border Leicester crosses. In each case pure-bred sires of these breeds were mated with Lincoln-Merino cross ewes.

As previously indicated, the lambs sent were not specially selected. The object was rather to test the market with average specimens of the different breeds. A prolonged spell of dry weather experienced in Riverina during the first half of last year, and the fact that the ewes lambed while on dry feed and rather low in condition, constituted a serious handicap, and the lambs raised at Wagga last season were certainly not up to the standard of previous years. This becomes evident on comparing the weights of lambs bred from the same crosses but raised in different years.

The above table gives particulars of the lambs bred at Wagga the year before this shipment was sent to London. Obviously a higher average body and consequently higher prices might easily have been secured had the carcases been graded. The object of the consignment, however, was to submit carcases representing a fair average of Australian lambs marketed in London last year. This is of infinitely more interest to growers than the securing of fancy prices for a few choice lines.

Depreciation in Weight.

In addition to the verdict of the London buyer, this consignment was made the test of other items of very great importance. The fullest particulars have been supplied regarding loss of weight in transit. After leaving the Farm the lambs were forwarded to Young, where the work of slaughtering, dressing, and freezing of the carcases was undertaken by the Country Freezing Company. The lambs were carefully weighed on leaving the Farm, and again on arrival at the freezing depôt. Though the journey only occupied twenty hours, the loss of weight was considerable. The lambs were slowly driven the 3 or 4 miles from the Farm to the railway station. The following table shows the material loss of weight during this stage of the journey. It also shows the difference between the live and dressed weights, and between the dressed and frozen weights of the different crosses :—

Cross.	No.	Average Live Weight.		Average Dead Weight.		
		At Wagga Farm.	At Young.	Dressed.	Fat.	Frozen.
		lb.	lb.	lb. oz.	lb. oz.	lb. oz.
South Down-Lincoln-Merino ...	32	67	58	31 13	3 9	29 14
Shropshire-Lincoln-Merino... ...	71	68	63	32 7	3 13	30 8
Hampshire-Lincoln-Merino ...	31	70	64	33 0	3 5	31 1
Dorset Horn-Lincoln-Merino ...	47	78	67	35 10	3 10	33 11
Border Leicester-Lincoln-Merino ...	40	71¼	62	33 0	3 0	31 6

Besides the averages shown, it might be of interest to state the limits within which the dressed weights of the various strains ranged. In the South Down cross the lightest weight of carcase was 25 lb. and the heaviest 38 lb. The Shropshire ranged from 25½ lb. to 41 lb.; the Hampshire from 25 lb. to 40 lb.; the Dorset Horn from 28 lb. to 43 lb.; and the Border Leicester from 26 lb. to 40½ lb. respectively.

The Value of the Carcases.

The carcases were forwarded to the Agent-General, who arranged for their sale in London. Appended is a copy of the letter sent to that officer, indicating what particulars were desired :—

I have the honor to inform you that 221 frozen carcases of lambs from the Wagga Experiment Farm have been shipped to you at London per s.s. "Morayshire," as per bill of lading enclosed. Particulars of these are as follow :—

Breed.	Brand.	No	Weight.
			lb.
South Down-Lincoln-Merino	C.F.C., Worregal, E5 ...	32	957
Shropshire-Lincoln-Merino	,, ,, D4 ...	71	2,166
Hampshire-Lincoln-Merino	,, ,, C3 ...	31	963
Dorset Horn-Lincoln-Merino .. .	,, ,, B1 ..	47	1,574
Border Leicester-Lincoln-Merino ...	,, ,, B2 ...	40	1,255
		221 c/s.	6,915

It is to be noted that these lambs have not been specially fattened, but have been obtained from the ordinary flocks of the respective crosses. The carcases represent the crossings of different breeds with which experiments are being conducted. It is, therefore, requested that you will kindly make arrangements with a suitable firm for the disposal of the carcases to the best advantage, and at the same time arrange for each lot to be sold separately to test whether there is any appreciable difference in the respective market value of the different crosses. The lambs have been raised under ordinary conditions, and represent a fair average sample of Australian lamb. The ages when killed were from 4½ to 5 months, with some up to perhaps a fortnight older.

A full report is required, giving particulars for future guidance respecting weights, quality, shape, size, whether too fat or too lean, and in what respect any of the crosses appear to be better or more suitable, together with any expression of opinion likely to be of value to breeders in Australia.

The following is the report received from the London salesman through the Agent-General :—

Just a few remarks *re* Wagga Experiment Farm lambs, ex the "Morayshire." After a careful and thorough inspection, and I might say that these lambs were given preference over others in the sale, so as to obtain full values and all the comments necessary, their respective values have resulted in, as near as possible, the neighbourhood of the following :—

	s. d.		s. d.	
South Down-Lincoln-Merino	2 8	—	2 9	a stone.
Shropshire-Lincoln-Merino	2 6	—	2 7	,,
Hampshire-Lincoln-Merino	2 6		......	,,
Dorset Horn-Lincoln-Merino	2 8		......	,,
Border Leicester-Lincoln-Merino	2 7		.....	,,

(A stone weighs 8 lb.)

Generally speaking, and from a selling point of view, for this market the South Downs are the best; the Dorsets have a good frame, and would be good carcases, but they are lacking in finish. The South Downs are certainly the best shape, and of the best quality. The Border Leicesters, Hampshires, and Shropshires are decidedly inferior to the other two breeds, being of the well-known Merino type, long in the legs, and decidedly lacking in fat. Perhaps the Shropshires are not quite so inferior on the general points as the Border Leicesters and Hampshires.

The weights which are the most valuable in the lambs are from 32 to 38 lb., but as a large majority of lambs in the market this season from Australia have been on the light side in weight, the heavier the carcase the more valuable it is But of course this does not always follow—it would depend upon the season.

We might mention that in all these lambs there is plenty of room for extra fattening, and fat lambs will never do much harm on this market. Lean lambs are not wanted.

So, generally speaking, South Down are the best, Dorsets coming second, and would be as good as the South Down if they had been finished off better, and carried some fat.

HUDSON, POLLEY, & CO. (LIMITED).

The Agent-General's covering letter reads :—

I am forwarding Messrs. Hudson, Polley, & Co.'s report, which deals fully with the different breeds. You will notice that the price realised was from 2s. 6d. to 2s. 9d. a stone. This is a good deal lower than the figures obtained for lambs which were on the market two months ago. The lambs just sold were superior as a whole to those sold in December, but the latter brought about 1s. per stone more; the present price being due to the circumstance that there is now an abundant supply of Australian lamb in the market.

T. A. COGHLAN.

Copy of Account Sales showing net proceeds from the Shipment :—

Account sales of 221 lambs, ex "Morayshire," Sydney.

Sold on account of the Agent-General for New South Wales, London.

		Stone.	Per lb.	£	s.	d.
South Down-Lincoln-Merino ..	32	113·0	4·08	15	7	4
Shropshire-Lincoln-Merino ...	71	256·6	3·72	31	16	8
Hampshire-Lincoln-Merino ...	31	114·3	3·76	14	6	8
Dorset Horn-Lincoln-Merino ...	47	188·2	3·80	23	16	10
Border Leicester-Lincoln-Merino ...	39	145·0	3·74	18	1	6
Claim on steamer	1	5·0	......	0	12	6

				£	s.	d.
Charges :				104	1	6
Storage, cartage dues, &c.	£4	3	4			
Commission, 2½ per cent.	2	12	1	6	15	5
Net proceed, cheque herewith				£97	6	1

HUDSON, POLLEY, & CO.
(W. H. HUDSON, Director.)

From this amount of £97 6s. 1d. there is to be deducted the charges for the slaughtering, dressing, and freezing of the carcases, in addition to the cost of freight from Sydney to London, also that from Bomen to Young. The value of the pelts and fleeces which the lambs cut is to be added to it.

The following account shows the net profit from the whole transaction:—

Cross.	No. of Lambs.	Wool. Weight. Total.	Wool. Weight. Average	Wool. Value per lb.	Wool. Proceeds	Skin. Weight. Green.	Skin. Weight. Dry.	Skin. Price obtained.	Skin. Proceeds.	Carcase. Weight when shipped	Carcase. Weights in London. Total.	Carcase. Weights in London. Average	Carcase. Price obtained per lb	Carcase. Proceeds	Total value of lambs per head.
		lb.	lb. oz.	d.	£ s. d.	lb.	lb.		£ s. d.	stones	stones.	lb. oz.	d.	£ s. d.	s. d.
South Down-Lincoln-Merino	32	80	2 8	8	2 13 4	205	95	4d. less 1 at 2d.	1 11 7	119·6	113·0	28 4	4·08	15 7 4	12 3
Shropshire-Lincoln-Merino...	71	191	2 11	8	6 7 4	397	211		3 10 2	270·7	256·6	28 14	3·72	31 16 8	11 9
Hampshire-Lincoln-Merino	31	77½	2 8	8	2 11 8	155	93		1 10 11	120·4	114·3	29 8	3·76	14 6 8	11 11
Dorset Horn-Lincoln-Merino	47	123	2 10	8	4 2 0	282	140		2 6 7	196·7	188·2	32 0	3·80	23 16 10	12 10½
Border Leicester-Lincoln-Merino	40	100	2 8	8	3 6 8	216	120		1 19 11	156·9	150·0	30 0	3·74	18 14 0	12 0
Totals	221	571½	..	...	19 1 0	1,255	659	...	10 19 2	864·3	822·1	...	...	104 1 6	12 1·6

Charges:	£ s. d.
Slaughtering, freezing, &c.	22 2 0
Freight—Sydney to London... ..	18 0 2
„ Bomen to Young	6 3 8
Storage and cartage—London ...	4 3 4
Commission—London, 2½ per cent. ..	2 12 1
„ on sale of pelts, 4 per cent.	0 8 10
„ on sale of wool, 2½ per cent.	0 9 6

	£ s. d.
Gross proceeds	131 1 8
	53 19 7
Net proceeds	£80 2 1

	£ s. d.
Average gross proceeds per lamb	0 12 1·6
Cost of treating, shipping, commission, &c., per lamb	0 4 10·6
Net Proceeds, per lamb ...	£0 7 3

The Structure of Root-hairs and the Absorption of Water.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Bureau of Microbiology.

THE need of the plant for water is almost greater than that of the animal, inasmuch as all the material required by the plant, excepting that which contains carbon, must be absorbed from the soil, and this food must be in solution in water before the plant can take it up. As soon as those substances in the earth which contribute to the food of plants are soluble in water or very dilute acid, they are *available* as nourishment; so long as they remain insoluble they are not available. It is not the purpose of this paper to discuss the manner in which insoluble material in the soil becomes soluble, but to give an outline, with the avoidance of technical terms as far as possible, of the present view of the manner in which water with nutrient material in solution enters the plant and is distributed therein.

The word "root-hair" is perhaps misleading. The hairs upon plants are entirely different from the hairs of animals. The term "hair" is applied in botany to external cells which have become lengthened. They may be so stiff as to become prickly, as in the comfrey, or they may be exceedingly soft and delicate, as in root-hairs. They are formed by the cells of the root which absorb nourishment from the soil becoming modified into a slender tube, closed at the end. They resemble, in fact, the fingers of a glove. They are set at right angles to the length of the root. Plants which grow in ground liable to periodic drought, and which at these times must secure all the moisture retained by the earth to save those portions that are in the air from death by drying out, endeavour to obtain as great an area of absorption as possible by the development of long tubular cells. Seen with the naked eye, or but slightly magnified, these delicate tubes often appear on the root as a velvety pile; more than four hundred per square millimeter have occasionally been counted.

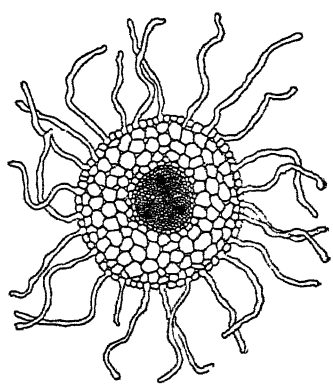


Fig. 1.—Transverse section of small root, enlarged.

The root-hairs are seen to be tubular prolongations of the outermost cells of the root. *After Bailey.*

These root-hairs are most commonly to be found close behind the growing tips of roots. When a seed germinates, as for example a grain of wheat, the young rootlets push forth first. Almost immediately behind the growing tip of the rootlet the root-hairs may be seen as a fine down, being sometimes so long and numerous as to have almost the appearance of a white mould.

Their length for the most part varies from a fraction of a millimetre to 3 millimetres, and their thickness between 0 008 mm. and 0·14 mm. These hairs only remain alive for a short period. As the roots grow and lengthen new hairs arise, always at the same distance behind the tip, whilst the older ones collapse, turn brown, and perish.

Root-hairs only grow in earth which is damp, and as a rule their course is not a straight line. They describe a spiral like a corkscrew as they grow, as though to discover the most favourable parts of the earth for absorption and attachment. In this manner they penetrate into the interspaces in the earth which are filled with air and water. They also have the power of thrusting aside minute particles of earth, especially if the latter consists of loose sand and mud. If they strike perpendicularly a solid immovable bit of earth, they turn aside and grow round it, with their surfaces closely pressed

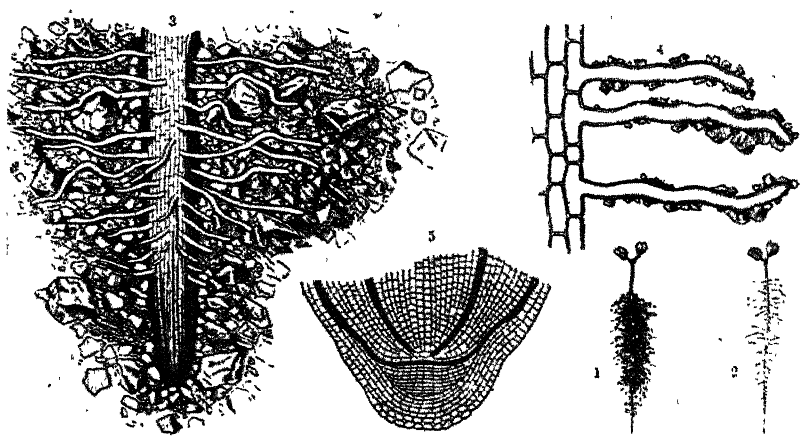


Fig. 2.—Absorptive cells on root of Penstemon.

1. Seeding with the long absorptive cells of its root ("root-hairs"), with sand attached.
2. The same seedling, the sand removed by washing
3. Root-tip with absorptive cells ; × 10.
4. Absorptive cells with adhering particles of earth.
5. Section through the root-tip ; × 60. *After Oliver.*

against that of the obstacle. When they encounter large grains of earth they sometimes stop and swell up in the shape of a club. The club divides into two or more arms, which grasp and cling to the granule like the fingers of a hand. Many fragments of earth remain thus in the grasp of finger-like growths, whilst other are held fast in the knots and spirals of the corkscrew-shaped root-hairs, which are often found tangled together. But the retention of most of the earth particles which adhere to a plant, including fragments of lime, quartz, mica, felspar, &c., as well as plant residues, is due to the fact that the outermost layer of the hair is sticky, it being altered into a swollen, gelatinous mass which envelopes the particles. When this sticky layer becomes dry it contracts and stiffens, and the granules partially embedded in it are thereby cemented so tightly to the absorptive cells that

even violent shaking will not dislodge them. If wheat is caused to germinate by being placed upon damp blotting paper, the root-hairs will become so firmly attached to the paper as to cause it to tear when an attempt is made to remove the young plant. In the case of most seedlings, and in that of grasses, the root-hairs which proceed from the roots, and which are especially numerous in the grasses, are generally thickly covered with particles of earth. If such a root is pulled out of sandy soil it appears to be completely encased in a cylinder of sand.

There can be no doubt that a plant can discern places that offer a supply of nutriment, and having found them, throw out anchors for safety. The root-hairs can only obtain food-salts when the ground is moist, and whenever roots, or rather their branches, have to choose between two regions, one of which is dry, and the other wet, they invariably turn towards the latter. The movements of roots as they grow in earth suggest that they are seeking for nutriment. The root-tip traces, as it progresses, a spiral course, as if it were constantly feeling its way. When the exploring root-tip comes near a spot where water occurs with food-salts in solution, it at once turns in that direction, and when it reaches the place, develops such root-hairs as are adapted to the circumstances.

In addition to the absorption of nutrient salts by root-hairs, there is also, in many cases, an interchange of materials; that is to say, not only do substances pass from the earth into the absorptive cells, and so onwards into the tissues of the plant, but others pass out of the plant through the absorptive cells into the earth. Amongst the substances thus thrown out, carbonic acid in particular plays an important part. A portion of the earth particles adhering to the root-hairs is decomposed by it, and food-salts in immediate proximity to these cells are thereby rendered available, and pass into the plant.

The method of making water-cultures of plants has been of great service in determining what chemical substances are of especial use to plants, and the part each plays in the building up of the tissues of the plant. While it is not natural for a plant that usually grows on land to have its roots surrounded by water, the process by which the water enters the roots, whether the plant is growing upon the land or in a water-culture, is probably the same. The question arises, why does the water enter the roots continuously? Is there really a suction exerted by the root-hairs, and if so, what causes it to be exerted?

Considerable attention has lately been given to the study of the passage of water and other liquids through thin membranes such as parchment. Two facts have been revealed which have an important bearing upon the absorption of water by roots. Firstly, if a dense liquid, such as water with a quantity of salt dissolved in it, is separated by a thin membrane from another liquid less dense, such as pure water, then water passes through into the salt solution, and the salt solution passes through into the water, until the two sides are of the same density; but the rate of the passage of the water through the membrane in one direction is at first much more rapid than that of the salt-solution in the opposite direction. Such a membrane is completely permeable.

Secondly, the membrane may be of such a nature that it only allows the water and not the substance dissolved in it to pass through; such a membrane is said to be "semi-permeable." There are numerous plant and animal membranes which are permeable to water but impermeable to many dissolved substances; they are therefore semi-permeable.

In a root-hair, there is externally the thin cell wall, which is completely permeable, enclosing the living material of the cell—the "protoplasm," which is semi-permeable; and within this protoplasm itself there is the fluid cell-sap. The relation of the membrane of protoplasm enclosing the cell-sap to the surrounding cell wall is similar to the relation of a football bladder to the outer leather covering, with this difference, that any decrease in bulk of the bag containing the cell-sap is followed only by a very slight contraction and still slighter change of shape of the cell wall. When root-hairs are immersed in a solution of greater density than their contents, then some of the contents leave the cell and pass into the surrounding dense solution When viewed under the microscope, this is seen to cause the membrane of protoplasm to detach itself from the cell wall and to shrink, the cell wall becoming itself very little affected. If the root-hairs are immersed in a solution of less density than their contents, water enters the cell, increases the pressure, and pushes the membrane of the protoplasm more closely if possible against the supporting wall.

Root-hairs, then, are exceedingly sensitive to any change in the density of the film of liquid which actually surrounds them in the earth; if it is made suddenly very dense or kept for a long time very dilute, it will result in injury to, if not in the death of, the plant.

The fact that the membrane of protoplasm in root-hairs is semi-permeable affords some explanation of the selective absorption exhibited by roots, that is, they do not absorb water and *anything* that is dissolved in it, but only those salts which will be of use to the plant.

Every kind of earth, but especially earth rich in humus and clay, has the power of retaining gases, and especially water and salts. When water containing salts in solution is poured over a layer of dry vegetable mould, it penetrates into the spaces between the particles of earth, and speedily drives out of them the air, which then ascends in bubbles. It is not till all the interspaces are full of water, while a fresh supply is constantly maintained from above, that any of the liquid oozes out from beneath the stratum of earth. Therefore we must conceive each of the soil particles as surrounded by an adhering film of water. The salts dissolved in the water are held with still greater energy. The water which trickles from the bottom of the earth always contains a much smaller proportion of salts in solution than that which was poured on above. These retained salts are to be regarded as forming an extremely delicate coating round the minute particles of earth.

The plant cells that are in close contact with the particles of earth exert apparently an energetic suction. It is supposed that wherever salts are abstracted from soil particles by suction a restitution of like salts immediately

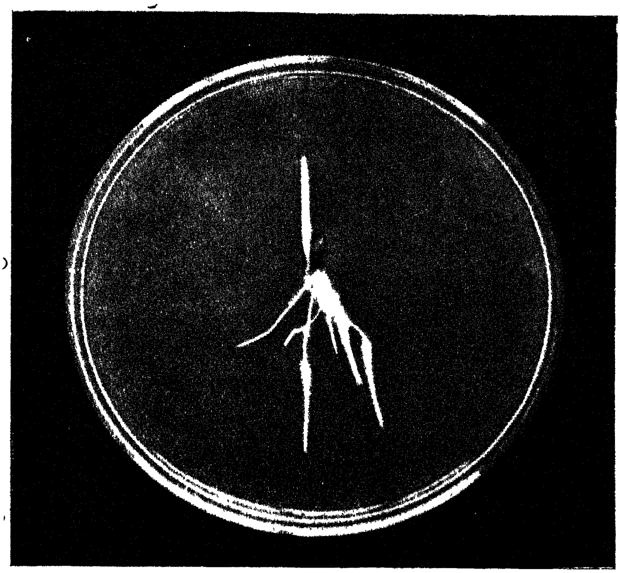


Fig. 3.—Root-hairs on Barley Roots. *After Hall*

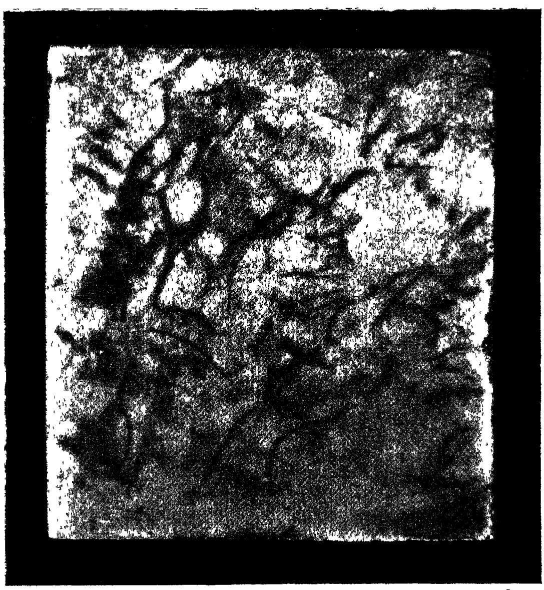
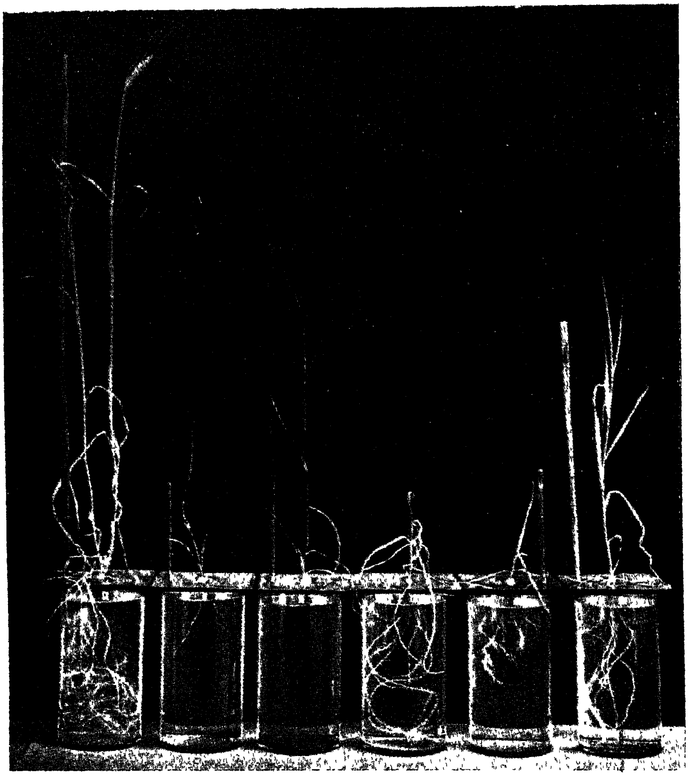


Fig. 4.

Polished surface of marble, etched with a series of markings representing the places where it has been in contact with roots, which thus evidently possess some power of dissolving the carbonate



1 2 3 4 5 6

Fig. 5.—Water Cultures of Barley.

1. Complete manure.
2. No nitrogen.
3. No phosphoric acid.
4. No potash.
5. No lime.
6. No magnesia. —*After Hall.*

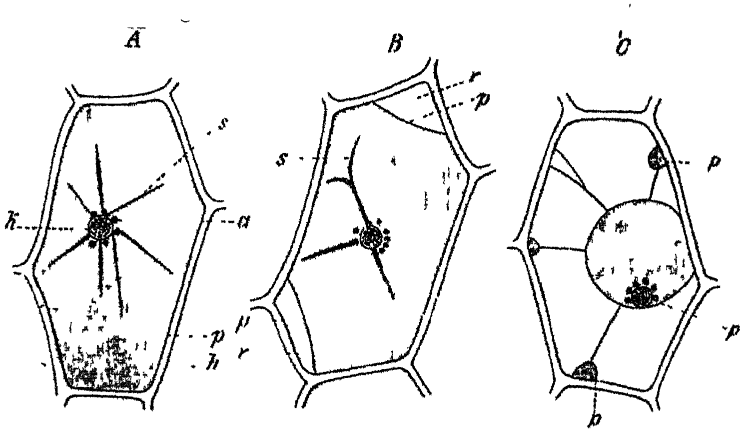


Fig. 6.

A—Single plant-cell highly magnified. *h*—The cell wall; *p*—The living contents or protoplasm.
B—A similar cell that has been surrounded with a dense solution. The protoplasm, *p*, shrinks away from the cell wall, leaving spaces *r*.
C—A cell that has been surrounded

takes place, a fresh influx taking place from the neighbourhood. Consequently the proportion of salts in the solution is always approximately the same, or at any rate is quickly restored. One advantage of this is that cells in immediate contact with particles of earth and their adherent liquid, can only meet with a saline solution of constant (weak) concentration, and are therefore secure from injury such as would result in the case of most plants from contact with a very concentrated solution. In other words, the absorptive power of earth acts as a regulator of the process of absorption of foodstuffs by plants, and is the means of keeping the saline solution in the earth always at the degree of strength best suited to the plant concerned. Naturally, the passage of salts from the earth to the interior of a plant is dependent on the aid of water containing both the substances composing cell-contents and the food-salts in solution. The cell membranes, through which absorption takes place, are saturated with this solution. The films of water adhering to the particles of earth, the water saturating the cell membrane, and the liquid inside the cells, are really in unbroken connection, and along this continuous waterway the passage in and out of substances in solution can take place easily. That a plant can thrive and obtain all that it requires by absorption of water with the necessary nourishing material in solution, is well shown in water-cultures, where plants are grown in jars containing water with small amounts of definite chemical substances dissolved in it. The plants will, with care, flower and ripen their seed, though supplied with no other substances than those in solution in the water.

The practical bearing of these various considerations regarding root-hairs may be briefly stated as follows :—

1. That all artificial manures should be in as fine a state of division as possible, and that they should be distributed through the earth as widely as possible, so as to come in contact with the maximum number of root-hairs. This indicates that the manures should not be sown *with* the seed, but round about it, and, if possible, underneath it.
2. That the application in too large a quantity of a very soluble manure, such as nitrate of soda, to a tree may result in the root-hairs becoming surrounded with a solution more dense than their contents. This will result in the shrinkage of the protoplasm, interference with the functions of the root, and the "die back" of the leaf-bearing branches.
3. That to immerse the roots of growing plants too long in water will render the root-hairs so turgid that they may be injured, while eventually their contents will be so reduced in density as to render them incapable of performing their proper functions.
4. That in the quest for a drought-resisting wheat, one character the plant should possess is the power to form numerous long and spreading roots and root-hairs, so as to obtain all the water available in times of dryness.

A Handy Surveying Instrument.

"P.O.I.," Wee Waa, asks where the "Anglemeter," referred to in *Gazette* of October, 1910, page 852, can be obtained, and price; he also asks for information as to its value in running lines through 1,400 acres of thickly-timbered country for ringbarking in sections.

Mr. P. G. Gilder, English Master, Hawkesbury Agricultural College, reports:—

The Anglemeter can now be obtained from Messrs. Turner and Henderson, Hunter-street, Sydney; price, about 4s. 6d. It is difficult to express an opinion as to its value for the purpose mentioned without knowing the extent of the writer's knowledge of mathematics. Unless he is able to plot his measurements of lines and angles on paper, and estimate the areas in this way, the Anglemeter will be comparatively useless, and its place can be taken by a chain.

If the correspondent will supply his measurements in the form of a sketch, showing all lines and angles, we will calculate the areas for him, and supply the working and a fair indication of the methods employed, to enable him to use the Anglemeter in future and make his own calculations.

Note.—The pamphlet supplied with the Anglemeter gives very explicit directions for its use, and much can be done with it, such as laying out right angles, without a great deal of mathematical knowledge. But its full value is only received by one who has studied farm surveying, such as is taught at the Hawkesbury Agricultural College. The offer made to "P.O.I.," to do the calculations for him, is open to any reader of this *Gazette* who cares to send his measurements to the Principal, Hawkesbury Agricultural College, Richmond. Any farmer who gets "stuck up" in trying to work out an area, or find the contents of a stack or dam, or any such problem, whether using an Anglemeter or not, is advised to communicate with the College, and the staff will be pleased to assist him.—Ed.

Successful Onion Culture.

Mr. E. McKeown, Lower Belford, Hunter River, recently forwarded to the Immigration and Tourist Bureau, specimens of Prize-taker onions for exhibition. Mr. McKeown states that the seed was sown late in the season (July)—1 lb. to the acre, in drills 12 inches apart, on black soil. No manure was used at planting time. The young plants went through a dry time, and seemed to be at a standstill; so to force them along Mr. McKeown applied ¾ cwt. sulphate of ammonia broadcast, and worked it in with hand Planet Junior. Rain fell soon afterwards, and the onions made great growth, top and bottom. The largest onions turned out where the plants were fairly thin, but even where sown thickly the sample was a fine one.

The yield of the acre sown was about 12 tons, besides a fair number lost through the heavy rain. Five tons were sent to Sydney, but unfortunately were delayed and became saturated with water, thus realising only 30s. per ton. In the local markets the average was about £5 per ton.

The onions exhibited were very fine, and the facts show the profitable nature of this crop.

Diseases of Animals.

Compiled by the Veterinary Officers of the Stock Branch, under the authority of
S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

No. 1.

WORM INFESTATION IN SHEEP.

THE area of New South Wales affected to a greater or less extent by worms in sheep is very large; in fact, apart, possibly, from the very dry areas, it is doubtful whether any part of the State is free, although the severity of the infestation is naturally far more noticeable on the coast and tablelands, in which districts the heaviest loss is sustained. It may be said that it is rare to find a flock of sheep which are not infested to some extent, although in very many cases the infestation is so slight that the sheep suffer no inconvenience and show no symptoms of disease.

Whether these parasites are spreading or not it is difficult to say, but the continual movement of sheep from one district to another certainly favours the spread of all varieties, as affected sheep taken into clean country soon infect it, and if conditions are favourable a permanent condition of infestation is set up. So long as sheep are kept on infected country this infestation will remain, varying in intensity and in many cases being quite negligible.

All breeds are affected, although the Romney Marsh and other English breeds, which have been accustomed to damp climates, would naturally be expected to show greater resistance than sheep accustomed to a dry hot climate.

The most important varieties of worms infesting sheep in this State are—*Strongylus* (*Hæmonchus*) *contortus; Strongylus filaria; Trichocephalus affinis; Æsophagostoma columbianum; and Tænia* (*Monezia*) *trigonophora* and *expansa*. These will be considered in the order given.

(1) Strongylus (Hæmonchus) contortus (Stomach-worm).

The commonest and at present the most destructive of the worms infesting sheep in this State. It is a thin, thread-like worm, the female 1 inch to 1½ inches long, and the male a little smaller. The body shows a red and white banding, due to the coiling of the ovarian tubes round the intestine, which, when filled with blood, in the fresh specimen is of a bright red colour. It is found often in great numbers in the fourth stomach or abomasum, and in cases of bad infestation in the third stomach also.

In order to find it, when the stomach is slit open the contents, if liquid, should be kept still for a few moments, when the worms will be seen

wriggling about in the fluid. In other cases this will be unnecessary, as the whole stomach contents will present a seething mass of worms. They are nourished by blood, sucked from the mucous membranes of the walls of the stomach, and cause much irritation. They are most severe on young lambs, and are generally most numerous in early autumn, although they may be found in numbers right through the winter to spring, especially in sheep weakened by early privation.

Sheep badly affected are dull and listless; the wool is weak and dry; the skin and visible mucous membranes pale and anæmic. They become emaciated; the appetite is poor and depraved, the sheep eating dirt and other foreign material. In cases of long standing, there is a dropsical accumulation of fluid between the jaws known as "bottle," and the animals are often pot-bellied. Diarrhœa is a common symptom, the fæces being black and offensive, and this is preceded by other signs of indigestion, such as constipation and tympany.

Death generally results from poverty and exhaustion, but in not a few cases animals in good condition succumb to the effects of the parasites. On making a post-mortem examination, apart from finding the worms, there will be noted a greater or less emaciation, according to the length of illness, and more or less anæmic condition of all the internal organs, with dropsical effusions in the serous cavities and into the connective tissues of dependent parts.

Treatment should be adopted early. Unfortunately it is too often put off until the sheep are actually dying, and then those left are so weak that many are unable to benefit greatly by the treatment given. It will well repay a farmer if, at the first sign of trouble, he takes steps to find out what disease is affecting his sheep, and then promptly acts on the information gained.

Although this pest is one of the most troublesome, it is also probably the easiest to deal with. The natural method of treatment consists of drenching, and for this purpose the arsenic drench, as previously recommended for a considerable period by the Stock Branch, and further experimented with lately by the veterinary staff, is probably the most efficacious.

To prepare it, take arsenic, 1 oz.; carbonate of soda, 2 oz.; and boil in about a quart of water until dissolved. Pour off the clear liquid; bury any sediment which may remain; and make up the liquid to 3 gallons with water. The dose of this drench for a grown sheep is 2 oz.; for a 6-month lamb, 1 oz.; and for a 9-month, 1½ oz. This gives a dose of 2 grains of arsenic to a grown sheep, with a decrease for young sheep according to their age.*

Sheep should be brought into the yards the night before drenching, as it will be found to be more efficacious if given on an empty stomach. The

Other drenches recommended are:—

(1) Oil and turpentine, 2 parts of the former to 1 of the latter; 3 oz. of the mixture being given to a grown sheep. This is a good drench, but is irritating and is liable to cause choking.

(2) Copper sulphate and mustard (copper sulphate, 2 drachms; mustard, 2 drachms; water, 2 pints); dose, 2 oz.

(3) Creosote, 2 drachms; water, 2 pints; dose, 2 oz.

sheep should be drenched either standing naturally on all four legs, with the head slightly raised, or sitting on their haunches. The head should not be forced too far back, nor the drench given too hurriedly, or choking may result. One drench is not considered to be sufficient, as it cannot be expected to expel every worm, and in badly-infested country a certain amount of reinfestation is certain to occur. Drenching should, therefore, be repeated in about fourteen days' time, and again if necessary one month later. No ill effects need be feared as a result of such drenching with arsenic, as in the experiments carried out at Glen Innes some of the sheep were drenched seven times in the course of the year, and no deleterious results could be observed in any way.

Sheep should be kept in the yards for two or three hours after drenching, and not allowed water in the meanwhile.

In addition to drenching, the sheep should always be provided with appropriate licks; in fact, whether worm-infested or not, sheep kept on the coastal or tableland areas should always have a sufficiency of salt-lick supplied to them. For worm-infested sheep the following lick will be found useful :—

Sulphate of iron, 1 part.
Bone meal or calcium phosphate, 5 parts.
Liverpool salt, 30 parts.

The lick should be supplied in suitable troughs where it will be protected from the rain, as if exposed to the weather much is lost and wasted.

Prevention of infestation by these parasites will be considered in conjunction with the general prevention of parasitic invasions.

(2) Strongylus filaria (Lung-worm).

A long, white, thread-like worm, which infests the bronchial tubes of sheep, occasioning what is known as verminous bronchitis. This is undoubtedly the commonest lung-worm found in this State, and it is responsible for not a little loss; although it cannot be regarded as so destructive a pest as the *Strongylus contortus*. It is, however, a far more difficult pest to deal with; in fact, in large flocks treatment is all but impracticable. Fortunately it would appear to be more or less confined to districts wherein the land is mostly held in small areas. It is particularly prevalent on the coast and in New England.

From our experience it would seem to develop somewhat later than *Strongylus contortus*, and to be particularly prevalent in the late autumn and winter, disappearing to a great extent from the sheep on the approach of summer.

Sheep, when badly infested, show all the general appearances of emaciation, anæmia, &c., usually associated with parasitic infestation; and in addition are subject to a chronic and irritating cough, with a discharge of much mucus from the nostrils. If a post-mortem examination is made and the lungs examined, greater or less areas of collapse, as indicated by a darkened and sunken appearance of the affected part, will be observed,

principally along the base and lower edge of the lung. These areas are usually roughly triangular, and are due to the occluding of the terminal bronchioles with the parasites and mucus.

If the trachea (windpipe) is now slit up and followed to its termination, and the bronchi resulting from its division are further followed up to the terminal air passages, it will be found that they are, according to the severity of the infestation, blocked up in part or wholly by masses of the worms, coiled about each other, and of the mucus thrown off as a result of the irritation induced by them.

Effective treatment may follow one of two lines:—

(1) *Intra-tracheal Injections.*—This method is only suitable for small flocks of stud animals, and although generally recognised as being highly effective, is not without danger, and requires care and skill in administration. The prescription used is as follows:—

Oil of turpentine	M XX	(20 drops)
Oil of creosote	M X	(10 „)
Chloroform	M X	(10 „)
Olive oil	ʒ i	(one drachm)

This represents an average dose for a grown sheep, and may be decreased by one-third for lambs. The injection is given directly into the trachea about half-way down the neck, either with a special syringe with a curved needle, or an ordinary hypodermic syringe. It usually induces severe coughing.

This requires repeating three or four times at intervals.

(2) *Fumigation with Fumes of Sulphur.*—This method is very suitable for small flocks, is safe if ordinary precautions are taken, and is fairly effective.

An air-tight shed with a low roof, or a tent, must be supplied, in which the sheep are placed. Masses of sulphur, or mixed sulphur and tar, placed on thin sheets of tin or iron, and so protected that danger of fire is avoided, are then lighted and the sheep exposed to the fumes. In a few minutes severe coughing will result, but sheep may safely be left for fifteen minutes in dense fumes without ill results. They should, of course, be watched continuously, and at the first sign of suffocation be released.

Fumigation should be repeated in two or three weeks, and, if necessary, a third time a month or two later, but it should not be carried out in bleak, cold weather, or congestion of the lungs may result in some cases.

Drenching for lung-worm has been extensively recommended, but our experience forces us to the conclusion that no drench is likely to be found efficacious for lung-worm. Amongst those experimented with by us were arsenic, copper sulphate, turpentine, creosote, and several proprietary drenches; and we find ourselves as a result unable to recommend any drench for lung-worm. We are aware that this is not the view of many sheep men and owners of proprietary drenches, but we would point out that lung worm is usually accompanied by stomach-worms. A drench given for

worms will as a rule expel the stomach-worms to a great extent, and the sheep being relieved of the worst of its two enemies, naturally does better and improves in condition, but the lung-worm remains untouched. We have so far not met with any sheep man or other person who verified his claims by post-mortem examination.

Having shown also that a drench administered naturally passes directly into the fourth stomach, we are unable to understand by what way such a drench, which, at any rate in the case of those most commonly employed, is not absorbed to any extent into the blood, can act on worms situated in the lungs.

We are convinced that the only efficacious method of combating lung-worm in large flocks lies in prevention.

(3) Strongylus rufescens (Lung-worm).

A very small, hair-like, reddish-brown worm, which in the adult stage lives in the bronchioles, but also invades the lung tissue, causing the formation of small irregular nodules, containing a certain amount of gritty, greenish pus. This condition has in the past been sometimes confused with tuberculosis. If present in large numbers these worms may interfere with the respiratory functions, but they cannot be regarded as of serious import in connection with the sheep in this State.

As far as bronchial infestation is concerned, the treatment as outlined for *Strongylus filaria* will be found effective, but nothing can be done once the lung tissue is invaded and nodules formed.

(4) Trichocephalus affinis.

This, the small, white thread-worm found in the cæcum and colon, cannot be regarded as of much importance, although if numerous it must cause a certain amount of irritation. It is usually found affixed by the head to the mucous membrane of the cæcum. It is easily identified by the long, hair-like, anterior portion, which enlarges into a thicker posterior part.

(5) Æsophagostoma columbianum.

This is a thin, thread-like, white worm, found in the intestines, but at certain stages of its life it also invades the intestinal wall and causes the formation therein of small rounded nodules—hence the term "pimply" or "knotty-gut." If cut into, these are found to contain the parasite and a certain quantity of greenish pus.

They may be found in quite young lambs, but are usually only found in numbers in aged sheep. In these latter they are sometimes so numerous that it is difficult to find any normal tissue in the wall of the large intestine, and they must have a decidedly deleterious effect on the health of the affected animals. Here again, whilst the worms free in the intestines will usually be dealt with by drenching as for stomach-worms, once the intestinal wall is invaded the condition cannot be removed.

(6) Tænia (Monezia) expansa and Tænia (Monezia) trigonophora.

These are the two tape-worms commonly found in sheep. *T. trigonophora*, very commonly found in very young lambs, is most prevalent in the autumn and disappears almost completely as spring comes on. Considering that it may attain to a length of 8 or 9 feet, and may be present to the number of ten or twelve in a single lamb, it must be conceded that it is likely to be a serious menace to the health of the animal. It can be effectively dealt with by the arsenic drench, administered for stomach-worm, or by other recognised vermifuges, such as kamala, in ½ drachm doses.

The Prevention of Parasitic Infestation.

The value of the old adage, "Prevention is better than cure," is very generally recognised, and in nothing is that more evident than in parasitic infestation. It must, however, be admitted that to prevent the infestation of sheep by one or other of the species mentioned above is by no means easy.

A consideration of the life-history of these parasites shows that they are taken in by the sheep in an embryonic form when feeding; and further, that although they can survive for a remarkable time the effects of dryness and cold, yet a fairly warm and moist condition of climate is most favourable to their development and increase. This is practically demonstrated by their increased prevalence following the late phenomenally wet summer.

Again, the embryo will not live for an indefinite time awaiting the arrival of a proper host; consequently the continued absence of such a host will eventually lead to the extinction of the parasite.

The following steps are recommended:—

1. The draining or fencing off of swampy lands.
2. The watering of sheep from troughs rather than from mud-holes.
3. An occasional burning-off of the pastures, whereby many embryos would be destroyed.
4. The continual provision of a suitable salt-lick.
5. The spelling of paddocks known to be badly infested. That is to say, for a time sheep should be removed from these paddocks and cattle or horses grazed thereon; or better still, they should be put under cultivation. Two years should elapse from the time sheep are taken off until they are put on again, and sheep should be thoroughly drenched before being put on to such country. The value of even one year's spelling was shown in no uncertain way in some of our experiments.

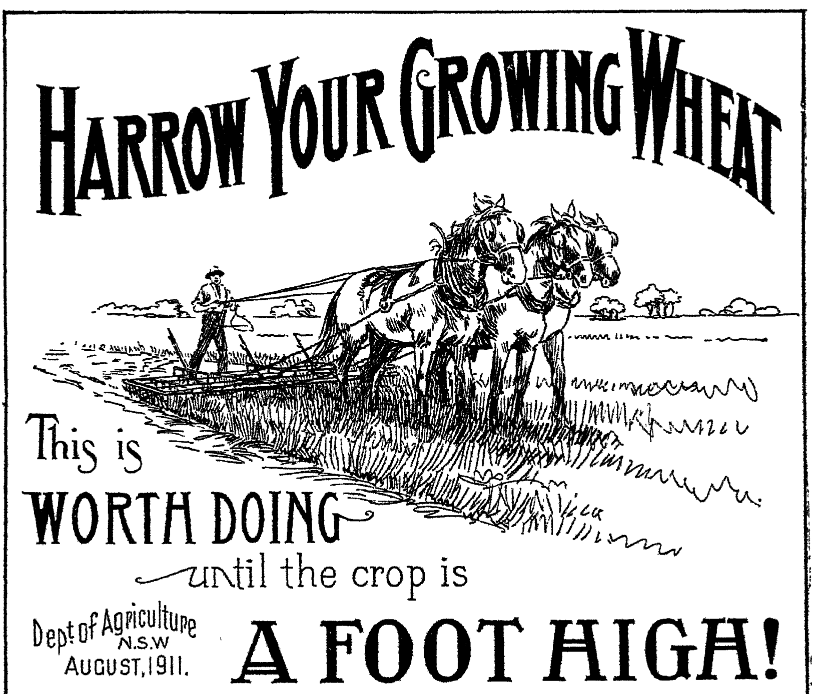
The above suggestions are, of course, in many cases, only practicable on small areas, but their value thereon can hardly be exaggerated.

We have seen then that definite measures to prevent infestation are difficult, but we have one very definite method by which we can prevent to a very great extent the ill effects of parasitic infestation. Again we admit that it is in many instances not applicable to large areas. It consists simply in a good and nourishing supply of feed. One qualification must be added to this: In a wet season, such as we have just experienced, some portion of that feed should be dry; in the average season that is not necessary.

In this connection we would point out the value of laying down a certain area of a farm with good introduced grasses, clovers, and lucerne, in place of the too often poor and innutritious natural herbage. This is particularly desirable in such districts as certain large areas of New England, &c.

To note the astonishing difference which a supply of good feed can make, we would direct the farmer's attention to a series of experiments reported in the *Agricultural Gazette* for April, 1910. He will see there that lambs fed on introduced pastures and untreated gained on the average $62\frac{1}{8}$ lb. from 7th January to 4th September; whilst lambs treated to the best of our ability, but running on natural pastures, gained on an average but 28 lb. The conditions under which the sheep were running, were, apart from the food supply, identical, although the introduced grass paddocks were more heavily stocked. All the sheep were infested, but the parasites were unable to affect the health of sheep with an ample supply of food. It is only the half-starved animal, or one which has been weakened by privations in youth, which is seriously affected in an ordinary season.

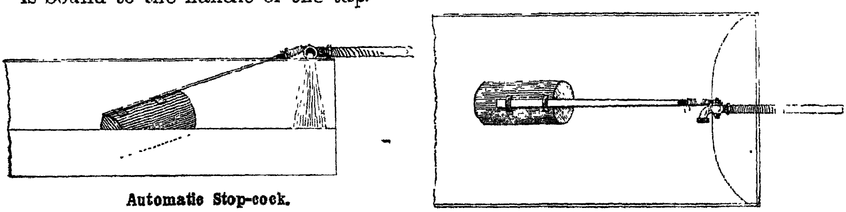
In a phenomenally wet season, although there may be plenty of feed, it has not the body requisite to build up hardy animals, and the sheep are more easily influenced by the parasites; besides which these latter are then far more numerous.



A Cheap Automatic Stop-cock.

An effective automatic stop-cock for regulating the flow of water into tanks, troughing, &c., can be made out of the seven-pound size tin used commercially for holding treacle or syrup, and an ordinary tank-tap. The kind of tap with the detachable handle should be selected.

The tin, which must not leak, should have the lid fitted as tightly as possible to make it watertight. On one side of the tin, two sockets of tin are soldered to take a piece of wood about 15 inches long and about 1 inch in diameter. One end of this rod is inserted in the sockets, while the other end is bound to the handle of the tap.



Automatic Stop-cock.

The tap is fitted to the water-pipe horizontally, and not vertically as when fitted to a tank, so that the stop-cock will act. The valve of the tap must be kept fairly free, so that the rise and fall of the tin in the water will open or close the tap without difficulty. The accompanying illustrations will show at a glance how the appliance is fitted. The length of the rod can be adjusted as required.—A. H. E. McDonald, Inspector of Agriculture.

Soils of the Nyngan Demonstration Farm.

H. I. JENSEN, D.Sc., Chemist's Branch.

THE six soils collected on the Nyngan Demonstration Farm are very well provided with mineral plant-food. The lime varies from satisfactory to good, potash is invariably good, and phosphoric acid is also present in satisfactory amount. The mechanical condition of all these soils is excellent, although the water capacity is perhaps a trifle on the low side.

Their greatest defect is their want of humus, organic matter, and nitrogen, which defect is, of course, the production of a semi-arid climate, and there seems to be no remedy of permanent value. Since several of the samples (Nos. 1, 3, 4, 5) were taken in well-grassed and forested country, it seems as if little lasting benefit can be expected from stable manure, organic matter, or green manure without simultaneous irrigation; and, of course, irrigation is out of the question until a water-supply is obtainable.

How nitrogenous organic matter may be introduced and retained in such a soil without irrigation is, therefore, one of the questions which must be solved by field experiment.

The subsoils contain pebbles of carbonate of lime of concretionary origin, which, I am informed, is also the case at Pera. The Nyngan soils are not unlike the Pera soils in colour, chemical composition, and mechanical condition. (*Cp.* R. S. Symmonds, *Agricultural Gazette*, Vol. XXI, Part 11, Nov., 1910.)

Soils typical of pine, wilga with box, buddha, and mallee (No. 1) country were taken, but they exhibit no striking differences on which one can base any conclusions. On the whole, it seems that the drier, more sandy parts favour pine, and the superficially moister and more clayey and acid soils favour buddha.

TABLE I.—Mechanical Condition.

Number.	Water Capacity.	Absolute Weight.	Capillary Power.	Clay.
	per cent.	lb. per acre.		per cent.
1. Horse paddock	Fair, 39	1,600,000	Excellent	83·8
2. Just ploughed	,, 37	1,750,000	,,	67·2
3. Pine country	,, 39	1,750,000	,,	67·2
4. Wilga-Box country	,, 36	1,800,000	,,	76·5
5. Buddha	,, 39	1,560,000	,,	79·7
6. Old ploughed field	,, 37	1,800,000	,,	49·9

TABLE II.—Chemical Composition.

No.	Reaction.	Moisture. (H_2O)	Volatile.	Nitrogen.* (N)	Lime. (CaO)	Potash (K_2O)	Phosphoric Acid (P_2O_5).
		per cent.	per cent.				
1	Faintly acid .	2·81	5·37	·070 Fair	·169 Satisfactory	·228 Good	·208 Good
2	Do ...	2·02	5·53	·052 Fair	·174 Satisfactory	·169 Good	·128 Satisfactory
3	Neutral ...	2·73	6·08	......	·364 Good	·333 Good	·142 Satisfactory
4	Do ...	2·00	5·32	......	·214 Satisfactory	·238 Good	·118 Satisfactory
5	Acid... ...	2·66	5·64	......	·100 Satisfactory	·291 Good	·156 Satisfactory
6	Faintly acid .	1·76	5·14	......	·200 Satisfactory	·236 Good	·160 Satisfactory

* The amount of Volatile being nearly the same in all cases, it was unnecessary to ascertain the nitrogen in all.

BEST DISTRICTS FOR CABBAGES.

"W.L." asks for information on cabbage culture—soils suitable, manuring, &c.

The best results are obtained in cool climates. For instance, one of the most suitable districts near Sydney is the Robertson and Burrawang district, where we find a cool climate and a fairly rich loamy soil. For manuring, it is best to use heavy dressings of stable manure with small quantities of fertiliser, such as the following:—

Bone-dust	9	cwt.
Sulphate of potash	1	,,

Applied at the rate of from 1 to 3 cwt. per acre.

The amount of artificial manure to be applied varies according to the quantity of stable manure used.

Provided the land is properly manured and kept in good condition, cabbages can be grown on the same land for a number of years; but, as with practically all crops, it is advisable to change the land occasionally—that is, to arrange some suitable rotation.—GEO. VALDER.

GRINDING CORN COBS.

"D.A.M." has a 22 h.p. suction gas-engine, and could run a corn mill easily enough. He grows a good deal of corn, and asks whether it would be advisable to grind up the whole cob.

Mr. Geo. Valder, Superintendent and Chief Inspector, replies:—

With a powerful engine, such as this, it would certainly pay to grind the whole cob. The core has a small feeding value, and in addition to this it acts like bran in aiding digestion. Provided the cost of grinding is not too high it pays well to feed the meal made from the whole cob.

Notes on the Wheats competing for Prizes at the Royal Agricultural Society's Show,

EASTER, 1911.

F. B. GUTHRIE.

IN common with the majority of the exhibits in other classes at the Royal Easter Show, the entries in the wheat section were considerably higher than on any previous occasion, the fifty-one exhibits entered in this section in 1910 having increased to seventy-five. As the entries were received at an earlier date than in previous years, it was possible to mill a greater number. Nineteen samples were put through the mill in order to provide a basis for the allotment of the prizes.

The exhibits in this section were a particularly fine lot, and the prize-winners had to compete with wheats which were very little inferior to themselves. A glance at the table giving the bushel-weights shows the superiority of the exhibits in this particular, which affords a fair indication of quality. Weights of over 66 lb. per bushel were frequent, whereas in 1910 only five or six exceeded this figure.

The increased flour-strength, particularly in the Farrer wheats, is equally remarkable, the average flour-strength of the seven wheats of this class, "Strong White," being 53·4 quarts water per sack; whereas last year the five wheats milled in this class (then known as "Medium Hard") was only 50, a difference of nearly 3½ quarts of water to the sack. This result is particularly encouraging in view of the opinion frequently expressed as to the possibility of this class of wheat losing its strong-flour characteristics under continued cultivation.

That this is not altogether due to the good season is shown by the fact that the next class, the Soft White class, has a lower average of flour-strength than last year. The average flour-strength of the four Soft White wheats milled at the 1910 Show was 48 quarts per sack, whereas the eight samples milled for this year's Show gave an average flour-strength of only 47.

The gluten contents are somewhat lower in all cases than last year, a result which is probably to be attributed to the cooler and moister conditions which prevailed generally during the ripening season.

A pleasing feature is the success of the late Mr. Farrer's cross-breds, which took first and second places in all classes except the Macaroni. The champion prize was awarded to a sample of Comeback grown at Tamworth, which variety also took first and second prizes in its class (Strong White). Jade and Bunyip also secured first and second places in the Soft White class.

But perhaps the most gratifying success was that of Cedar in the Hard Red class—a class which has been hitherto practically solely represented by

Manitoba wheat. The two samples of Cedar which were shown took first and second place respectively, and completely out-pointed the three Manitoba wheats exhibited in the same class. Their superiority as milling wheats was specially shown in the higher bushel-weights and greater flour-strength. They also yielded their flour more readily, and it was of a better colour than the sample of Manitoba which was judged to be of sufficiently high standard to be milled. This will be seen from the table of milling results.

The first and only prize in the Macaroni class went again to a sample of Indian Runner from South Australia.

The judging was carried out as in previous years. The bushel-weight of all the samples was taken, and the results are given in the first of the tables which follow.

After careful inspection to eliminate the inferior exhibits, those which were considered eligible for prizes were milled on the small model mill of the Department of Agriculture, and the prizes were finally awarded in accordance with their actual behaviour in the mill, marks being assigned to the different milling characteristics. The result of these tests will be found in the table headed "Results of Milling Tests," in which table the figures within brackets give the actual milling results, the other figures giving the marks obtained.

The judges were Messrs. R. W. Harris, head miller, Gillespie Bros., and G. W. Norris, Chemist's Branch, Department of Agriculture; the milling of the samples being carried out by Mr. Norris.

Weights per Bushel.

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
		Class 731 (Macaroni Wheat).			
5158	Indian Runner	65	5160	Medeah	61
5159	Belotourka...	62	5161	Macaroni	64¼
		Class 732 (Hard Red).			
5162	Cedar	66	5165	Manitoba	64
5163	Manitoba	61¼	5166	Cedar	64¼
5164	,, ...	63			
		Class 733 (Strong White).			
5167	Bobs	64¼	5185	Comeback	65¼
5168	Comeback	65½	5186	,, ...	64¾
5169	Suttor's Prolific	63	5187	Bobs	63
5170	Comeback	65	5188	,, ...	65¼
5171	Tarragon	64¾	5189	Comeback	64½
5172	Comeback	65¼	5190	,, ...	66¼
5173	,, ...	65½	5191	Suttor's Prolific ...	64
5174	Bobs	63½	5192	John Brown	64¾
5175	,, ...	64¼	5193	Florence	64
5176	,, ...	64¾	5194	Comeback	65½
5177	Cleveland	62¾	5196	,, ...	65¼
5178	Comeback	65	5197	Bobs	66
5179	,, ...	64¼	5198	Comeback	66
5180	Bobs	64¼	5199	,, ...	66¼
5181	Jonathan	63¾	5200	,, ...	66½
5182	Bobs	65½	5201	Bobs	66
5183	,, ...	64¼	5202	Comeback	65¼
5184	Comeback...	65¾			

Class 734 (Soft White).

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
5203	Federation ...	61¼	5215	Bunyip ...	63
5204	Marshall's No. 3 ...	62½	5216	,, ...	63
5205	Petatz' Surprise ...	66½	5218	Jade ...	64¾
5206	Dart's Imperial ...	63	5219	,, ...	65¼
5207	,, ...	65¼	5220	Federation ...	62¾
5208	Federation ...	63	5221	,, ...	63
5209	Bunyip ...	63¼	5222	Steinwedel ...	63¾
5210	Purple Straw ...	61½	5223	Dart's Imperial ...	63¼
5211	Bunyip ...	63¼	5224	Bunyip ...	64¼
5212	Steinwedel ...	64	5225	Dart's Imperial...	63¼
5213	Dart's Imperial ...	64	5227	Yandilla King ...	62½
5214	Jade... ...	65¾	5228	Marshall's No. 3 ...	63¼

Special Prize (Five Farrer Wheats).

Catalogue No.	Weights. lb.	lb.	lb.	lb.	lb.	Average Weight. lb
5229 ...	64¼	66	65	65	65½	65 15
5230 ...	62¾	63½	63	65½	63¼	63·6
5231 ...	64¼	65	65	63½	65½	64·7
5252 ...	66	63¾	64¼	65½	64¼	64·7

Special Prize (Five non-Farrer Wheats).

5233 ...	65¼	65¼	64	65½	64	64·8
5234 ...	60½	65	62¾	66	63¾	63·6
5235 ...	63¼	65	62¼	64	63½	63·6

Awards.

Class 731.—Macaroni.
- First Prize, No. 5158, Indian Runner, grown by W. Clark, at Angle Vale, S.A., on sandy soil; seed per acre, 1 bushel; yield per acre, 20 bushels.
- Second Prize (not awarded).

Class 732.—Hard Red.
- First Prize, No. 5162, Cedar, grown by W. T. Clonan, at Gunnedah, on red and chocolate soil; seed per acre, 40 lb.; yield per acre, 12 bushels; 25 inches of rain for the 12 months.
- Second Prize, No. 5166, Cedar, grown by Towri Estate, Maryvale, on red chocolate soil; seed per acre, 42 lb.; yield per acre, 11 bushels 40 lb.; rain during growth, 8 inches 97 points.

Class 733.—Strong White.
- First Prize, No. 5200, Comeback, grown by W. Squires, at Goonoo Goonoo, Tamworth, on heavy loam; seed per acre, 45 lb.; yield per acre, 9 bushels; rain during growth, 10 to 11 inches.
- Second Prize, No. 5194, Comeback, grown by Smith Pollock, at Glengarry, Quirindi, on sandy soil; seed per acre, 45 lb.; yield per acre, 18 bushels; rain during growth, 13 inches.

Class 734.—Soft White.
- First Prize, No. 5214, Jade, grown by Geo. Lindon, at Gobbagombalin, Wagga, on shaly loam; seed per acre, 35 lb.; yield per acre, 24 bushels; rain during growth, 10½ inches.
- Second Prize, No. 5224, Bunyip, grown by Towri Estate, Maryvale, on red chocolate loam, seed, 42 lb. per acre; yield per acre, 15 bushels; rain during growth, 8 inches 97 points.

Champion Prize for best bag of wheat exhibited, No. 5200, Comeback, grown by W. Squires.

Special Prize for the best collection of Five Farrer Wheats, No. 5229, H. Farthing; varieties: Comeback, Bobs, John Brown, Jonathan, Cumberland; grown at Beetive, *viâ* Tamworth, on chocolate soil; seed, 45 lb. per acre; rain during growth, about 10 inches.

Special Prize for best collection of Five non-Farrer Wheats, No. 5233, J. W. Coupland; varieties: Marshall's No. 3, Dart's Imperial, Purple Straw, Steinwedel, Yandilla King, grown on the Peel River Estate, on heavy loam; seed, 1 bushel per acre; yield per acre (various) from 9 to 14 bushels; rain during growth, about 10 inches.

Results of Milling Tests.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.				**Class 731 (Macaroni Wheat).**				
5158	8	*[65]* 14	6	*[69·1]* 6	6	*[12·24]* 18	*[48]* 13	71
				Class 732 (Hard Red).				
5162	8	*[66]* 15	8	*[72·4]* 9	15	*[11·48]* 17	*[57·6]* 20	92
5166	9	*[64¼]* 13	8	*[70·0]* 7	15	*[12·42]* 18	*[57]* 20	90
5165	7	*[64]* 13	8	*[67·3]* 5	14	*[13·06]* 19	*[53]* 16	82
				Class 733 (Strong White).				
5200	10	*[66½]* 15	8	*[70·2]* 7	14	*[13·8]* 20	*[56]* 19	93
5194	9	*[65½]* 14	8	*[73·1]* 10	13	*[14·18]* 20	*[55·4]* 18	92
5201	10	*[66]* 15	8	*[71·4]* 8	15	*[10·89]* 17	*[55·2]* 16	89
5193	10	*[64]* 13	8	*[71·6]* 8	15	*[13·34]* 19	*[52·4]* 15	88
5190	10	*[66¼]* 15	8	*[71·9]* 9	15	*[12·12]* 18	*[48·6]* 13	88
5202	9	*[65½]* 14	8	*[70·4]* 7	12	*[13·8]* 20	*[54]* 17	87
5188	9	*[65¼]* 14	8	*[69·8]* 7	14	*[9·73]* 16	*[52·2]* 15	83
				Class 734 (Soft White).				
5214	10	*[65¾]* 15	10	*[73·3]* 10	15	*[9·9]* 16	*[45·6]* 11	87
5224	9	*[64¼]* 13	10	*[72·8]* 10	15	*[11·36]* 17	*[47·6]* 12	86
5225	10	*[65¼]* 14	10	*[70·6]* 7	13	*[10·43]* 16	*[52]* 15	85
5205	10	*[66½]* 15	10	*[68·8]* 6	15	*[11·52]* 17	*[45]* 11	84
5209	9	*[63¼]* 12	10	*[71·7]* 8	14	*[13·18]* 19	*[47·6]* 12	84
5219	9	*[65¼]* 14	10	*[70·2]* 7	15	*[10·01]* 16	*[45]* 11	82
5207	9	*[65¼]* 14	10	*[70·0]* 7	12	*[12·43]* 18	*[47]* 12	82
5218	9	*[64¾]* 13	10	*[69·3]* 6	15	*[9·05]* 15	*[45·8]* 11	79

Handy Repairs on the Farm.

P. G. GILDER, English Master, Hawkesbury Agricultural College.

I.—A Broken Drill-pole.

A FRACTIOUS filly, not long broken in, played up, and in her excitement, fell and broke the pole of a seed-drill at the College. The break is shown in Fig. 1. The absence of such an implement, capable as it is of sowing an acre

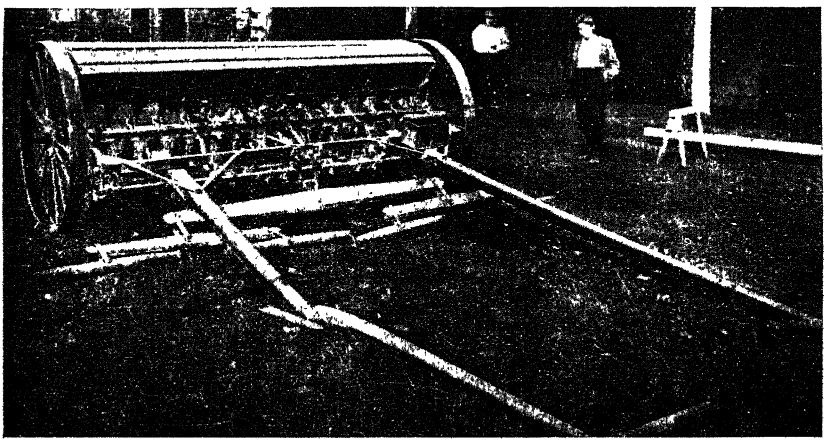


Fig. 1.—The broken pole.

in twenty minutes or half an hour, is of material consequence during the planting season, and every effort was naturally made to fit it for use at the earliest opportunity. While a sapling from the neighbouring woodlot fastened with the never-failing fencing wire, sufficed to enable the implement to be used for the remainder of the day, it was possible to renew the broken part the same evening. As the faulty pole could be removed to act as the pattern for the new one, the work of replacement was comparatively easy.

As there is practically very little strain (unlike in a lorry, where the pole would have to be of hardwood), a piece of straight, even-grained Oregon, 4 inches by 3, and 12 feet long, would have sufficed; but as a piece 7 inches wide was available, a pair of effective poles were made at the same time, one to remain on hand in the event of an emergency again arising. (See Fig. 2.) The pole in this instance was sawn to 4 inches x $2\frac{3}{4}$ inches at the end bolted to the machine, and reduced to $2\frac{1}{2}$ inches x $2\frac{1}{2}$ inches at the other.

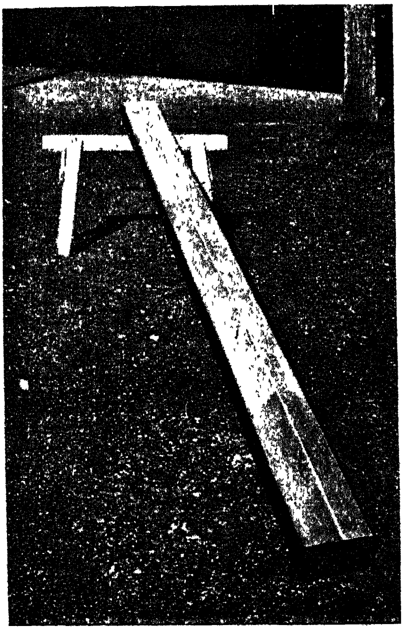


Fig. 2.—The timber marked for sawing.

The only tools necessary to make an effective job were:—Rip-saw, hand saw, German jack, jack-plane, spokeshave, square, rule, pencil, brace and bits. Even some of these might have been dispensed with.

The pole was given a well-rounded edge, and stop-chamfered with the spokeshave, and the bolt-holes drilled where necessary. (See Fig. 3.)

In practice it is advisable to screw a plate on the pole (a piece of an old strap or T hinge will make a good substitute) just where the swingle-trees work to and fro on it, to lessen the wear on the wood itself.

A handy man with the barest possible knowledge of carpentry should be able to complete this job in a couple of hours, and when given a coat or two of paint, the home-made replacement should be equally as effective as any that a tradesman could supply.

Fig. 3.—The finished poles.

Liming Grass Paddocks.

A Moss Vale correspondent asks whether it would kill the grass to spread powdered but unslaked lime over grass paddocks, or whether the lime should first be slaked.

It is best to slake the lime first, but do not let it break up too fine before applying it. After spreading the lime, harrow lightly. Top-dressing grass lands with lime generally pays well.—Geo. Valder.

Our Experiment Farms.

J. E. O'GRADY.

NYNGAN.

Acting Manager, H. J. Kelly.

SEVERAL times during the past decade efforts have been made to define the western boundary of our wheat belt, but it has only been possible to prepare an approximate line. We can assert that a considerable extension has occurred within the past ten years, and yet we cannot point to any particular locality and say that wheat is extensively grown in that district where it was not grown at all ten years ago. The development is gradual, and consists more in the bringing of larger areas under the plough in districts served by the railway than in the sudden discovery of profitable wheat lands. For there are always pioneers in the central west who will strike out with their ploughs beyond what more cautious men regard as the "safe" boundary. In good seasons their efforts are handsomely rewarded, and others follow. Better methods of cultivation, better machinery, and better varieties of wheat combine to gradually make the district prosperous.

Such a district is Narromine, once regarded as the fringe of the sheep country and the gate of the "Never Never," now a thriving centre of agricultural activity, its broad red plains rivalling in productiveness the rolling wheat lands to the east.

Mungeribar station is surrounded by cultivated paddocks, and at Trangie the plough and seed-drill are still in evidence; but beyond the latter township cultivation is rarely seen from the railway. Wheat has not yet replaced kangaroo grass and mulga, pine scrub and box, and the beautiful wilga—the most shapely and brightest of our inland trees, always green in the memory of those who regard the west as home.

But if we imagine that we have now reached the utmost limit of cultivation, let us turn up the *Agricultural Gazette* for October, 1900, and we find Mr. Peacock describing the efforts of farmers around Girilambone; and Girilambone is 85 miles north-west of Trangie. In these districts the normal rainfall is far too light, and the evaporation far too great, for the ordinary methods of farming to succeed. In some favoured seasons a sufficient quantity of rain falls at the right period for the good western soils to yield a little of their pent-up fertility, but nothing but disaster can await those who expect such seasons to be repeated year after year. The man who scratches up this soil in March or April, sows his wheat, and expects to receive repayment for his labour, is taking very long odds.

"Water, and the right kind of water, is the great need of the west," says Dr. Jensen, after a long scientific discussion of its geology, climate, and soil.

A certain amount of irrigation may be possible by storing, at great cost, the head waters of the Darling and its tributaries, or in some districts by tapping the alkaline artesian waters within the earth; but the greatest hope lies in the evolution of methods of conserving in the soil the rain which falls, and making it available for the crops at the time they need it. Professor King, of Wisconsin University, has shown that with 12 inches of rain actually passing through a crop it is possible to get 40 bushels of wheat per acre. So that if it were possible to absolutely prevent all evaporation, and ensure the availability of every drop of rain which falls during the year, we might expect to see the plains around Hungerford yielding annual crops of 40 bushels of grain. This is, of course, absurd in the extreme; but it is only absurd because field science has not told us how to convert the soil into a perfect reservoir, conserving the rain as it falls, and yielding it up to the crop at the moment and in the manner required.

This is the direction in which scientific investigation and experiment can afford the greatest assistance to Australian agriculture. Over the great bulk of our continent the rainfall during the growing period of crops is insufficient for best results from the soil. Science must show us how best to conserve the available moisture in different localities and under different conditions. It is one problem in the Pinnaroo district of South Australia, another on the red wheat lands of Riverina, another on the black soil plains of Coonamble, and yet another in the West Bogan country with which we are now dealing.

Enough and more than enough has been written of the possibilities of western New South Wales, and the romance of life on the plains has been set down in prose and verse. The cold truth is, that with present methods the country is more fitted for pasturing sheep than for cultivation, and that when its mineral resources are exhausted its already small population will be still further diminished—unless Farrer's dream can be realised, and the soil made to produce food for man and beast in place of the useless pine scrub and buddha.

The investigations of this Department into the problems of dry farming in the western districts were commenced at Coolabah Experiment Farm some fourteen years ago. Under the supervision of Mr. R. W. Peacock, the first Manager, many initial difficulties were overcome. Whilst Mr. G. L. Sutton, our late Wheat Experimentalist, acted as Manager, the experiments were carried to such a conclusion that it was considered sufficient was known to justify the cultivation of wheat and fodder crops, combined with sheep-raising, as a commercial proposition on the West Bogan lands. Operations were then transferred to a more accessible site, south-east of Coolabah, but still west of the Bogan, and Nyngan Demonstration Farm was established in April, 1909.

The Farm and its Object.

The 5,750 acres selected for the operations adjoin the Great Western Railway, about 2½ miles from the town of Nyngan. The land was made available through the original settlers abandoning their holdings. The cultivation area

is so situated that passengers on the line between Nyngan and Bourke will see the bulk of the demonstration paddocks, the whole of the experiment plots, and the block of farm buildings standing in a clump of wilgas at the rear.

The rainfall at Nyngan, as at all western stations, varies considerably in quantity per annum and in seasonal distribution. For the past twenty-eight years the annual average has been 17·63 inches, and the following table shows the average monthly precipitation:—

	Points.		Points.
January	204	July	108
February	228	August	151
March	189	September	101
April...	161	October	97
May	143	November	123
June	110	December	148

In 1910 the total rainfall was 15 53 inches.

The wettest months, then, appear to be those immediately preceding sowing, and practical wheat-growing would appear to be merely a matter of ploughing in January or February and cultivating after every rain until sowing time. The man who tries to work on this principle is wiser than the March or April farmer, but still he would not succeed over a run of seasons. Those January, February, and March averages are the means between very wide extremes. Summer rain in the west comes in monsoonal storms, and may come in any month during the hot weather. To plough in summer before the rain is a very severe strain upon men and horses in that hot climate; to plough after the rain is not the way to conserve moisture.

The area of the Farm is practically level throughout, and the elevation above sea-level is 570 feet. The soil is typical West Bogan, and is not considered rich for that district. It is estimated that from 6,000 to 10,000 acres of such land constitute a living area.

From Dr. Jensen's report, given in this *Gazette*, it will be seen that the soil at Nyngan Farm is chemically and mechanically good; and the same remark must apply to the great bulk of the West Bogan land. Humus is required to retain moisture. The nitrogen content is only fair; but under our dry conditions, whatever the cause may be, the soil does not seem to require much nitrogen to produce wheat.

To Mr. Sutton, who planned the operations, and under whose management the Farm was opened, Nyngan was simply a problem. How could agriculture be carried on most remuneratively in a district of light and uncertain rainfall, high temperature, as level as a billiard table, and with soil of good quality, but liable to set hard in dry weather? He had to aid him the knowledge gained by the Department in twelve years at Coolabah, and the fact that the district is eminently suitable for merino sheep. He gave his attempt at a solution in the *Gazette* for May and November, 1909, and January, 1910 (Farmers' Bulletin, No. 32—"Cultural Methods for Wheat-growing in Dry Districts"); and again at the Wheat-growers' Conference, Sydney, 19th July, 1910 (Farmers' Bulletin, No. 42—"Conference of Wheat-growers, with Special Reference to Dry Farming"). The work at Nyngan Demonstration

Farm will be a practical test of the value of that attempted solution, together with a series of experiments to ascertain if there is a better one. The actual work is under the control of Mr. H. J. Kelly, who was foreman at Coolabah Farm for some years.

The Main Principles.

Half the battle, in dry farming, is won if the soil is sufficiently moist to germinate the wheat. The crop may not reach the grain stage, and may require to be cut for hay or fed-off, but some return for time and labour is secured. In many seasons in western districts ground broken in March is as dry as ground can well be in a natural state. Chemical analysis may show a small percentage of moisture, but the wheat will not find it. In Riverina, with its winter rains, one may reasonably rely upon the May and June rains being sufficient to bring the wheat up; but not on the West Bogan. Those 143 and 110 points May and June averages *may* come, but they are too uncertain to count upon. If we wish to make these plains carry a larger white population, we must have a system of farming which does not leave everything to an uncertain chance. Early ploughing, and subsequent cultivation to conserve moisture, are essentials of success.

Ploughing, even in the early summer, is a difficult task. The ground is very hard, except immediately after rain, and the heat and dust make the work very laborious to men and horses. Mr. Sutton proposes that we should "go the whole hog," and plough during the winter or early spring, when the weather is cool, and the ground generally in good order. Shallow cultivation, to maintain the mulch during the summer, is not impracticable, as the work is much lighter. A rational application of these principles will, in normal seasons, ensure a sufficiency of moisture in the soil to germinate the wheat.

This would amount to bare fallowing, giving a crop every second year. Such a system would be far ahead of the "pot luck" methods; but it has very serious defects in dry districts, and does not lead to the maintenance of permanent fertility. The soil becomes depleted of organic matter, or "humus," so beneficial in retaining both moisture and fertility; and the farmer is throwing away the opportunity of carrying sheep upon his holding. He is forgetting that he is working in the country which has developed the big-framed merino, the most valuable sheep in the world, whose annual wool-clip is worth many millions to New South Wales. No system of farming can be the ideal one which does not provide for the utilisation of this marvellous development.

Conservation of soil moisture and humus, and the carrying of sheep, are the warp and the woof of western agriculture. How can they be woven into a fabric to suit our special requirements? Rotation of crops, judiciously planned, is the loom which promises to achieve the magic change. The growing of suitable fodder crops will supplement the natural pastures, and enable the country to support more sheep than at present. It will also, by the decay of the roots and the ploughing in of animal excreta, maintain and increase the humus content of the wheat land, with all the other advantages accruing from change of crops.

There is yet another important requirement in an ideal system. We know that in the west there are years, or series of years, when the rain falls far below the average. No satisfactory explanation of these phenomena has yet been offered, and no satisfactory basis of annual forecast has been evolved. All we know is that such seasons occur at irregular intervals. An ideal system of farming must make permanent provision against these lean years. Ensilage stands out prominently as the best means of making such provision, and the ideal system must include the growth of crops suitable for conservation as silage.

The Application of the Principles.

Mr. Sutton has suggested for the West Bogan lands a rotation which provides for the growing of two crops—one of wheat, and the other of fodders—every three years, the cultivation area being divided into three portions of approximately equal extent. In a given year one portion will be under wheat, preceded by a summer fallow; a second will be fallowed; and the third under fodder crops. The fodder crops suggested are rape, a winter crop; cowpeas, a summer leguminous crop; and sorghum, a summer non-leguminous crop, eminently suitable for ensilage in a district too dry for maize. Each of these will be preceded by a fallow, the ploughing being done in winter or early spring.

This is the rotation which will be practised upon the demonstration area of Nyngan Farm. The following table shows the cropping proposed:—

Year.	Area No. 1.	Area No. 2.	Area No. 3.
1912 ...	Stubble ... Fallow ...	Rape ... Cowpeas ... Sorghum ...	Fallow. Wheat.
1913 ...	Rape ... Cowpeas ... Sorghum ...	Fallow ... Wheat ...	Stubble. Fallow.
1914 ...	Fallow ... Wheat ...	Stubble ... Fallow ...	Cowpeas. Sorghum. Rape.

In 1915 the cropping will be the same as in 1912. About 200 acres will be devoted to each section of the rotation, and the paddocks are so placed that portion of each section fronts the railway line.

Those who wish for further details of this scheme of cropping should apply to the Department for a copy of Farmers' Bulletin No. 42—"Conference of Wheat-growers, with Special Reference to Dry Farming"—which contains a full report of a lecture delivered by Mr. Sutton before the 1910 Conference. The bulletin also contains numerous papers and discussions, both practical and scientific, respecting all phases of wheat-growing, and a copy should be in the possession of every Western farmer.

Another advantage claimed by Mr. Sutton for this system of cropping, is that it distributes the work of the farm evenly over the year, thus enabling the farmer to profitably employ most of the men required at harvest time throughout the whole twelve months. This security of employment should induce more of the best class of workmen to take up agricultural life. Some of the larger wheat-growers of the West, who are adopting the system with modifications to suit their conditions, are finding it in their interest to erect workmen's homes upon their properties. This is a direct answer, straight from the land of wheat and sheep, to the accusation recently made in England that married men are not desired as immigrants to Australia.

Experiments.

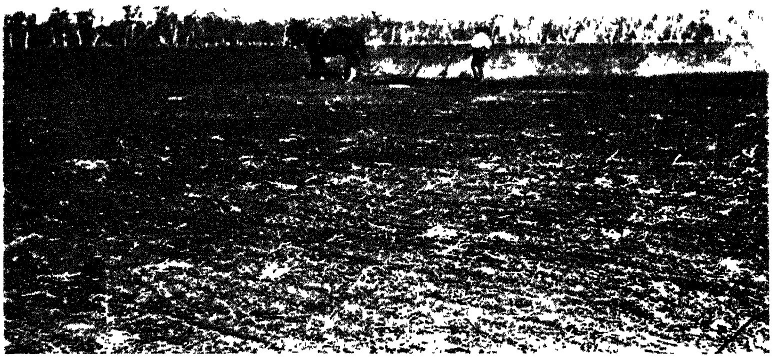
There is no such thing as the final word in agriculture, especially under Western conditions. Scientific experiments will continue to suggest improvements, in detail if not in principle, in farm practice. Recognising this fact, the Department proposes to carry out a number of experiments at Nyngan, on the areas set apart for the purpose. Brief mention only can be made here of the principal experiments suggested by Mr. Sutton, and approved by the Experiments Supervision Committee.

It is not at present proposed that portion of the wheat-breeding work should be conducted at this station, but trials of different varieties will be made each year to determine those most suitable for hay and grain. The best quantity of seed to sow per acre will also be tested with varieties known to be suitable. Several experiments with fertilisers, aiming at obtaining knowledge on different points, will be conducted. The best depth to plough, and the best type of plough to use, will be the object of another experiment.

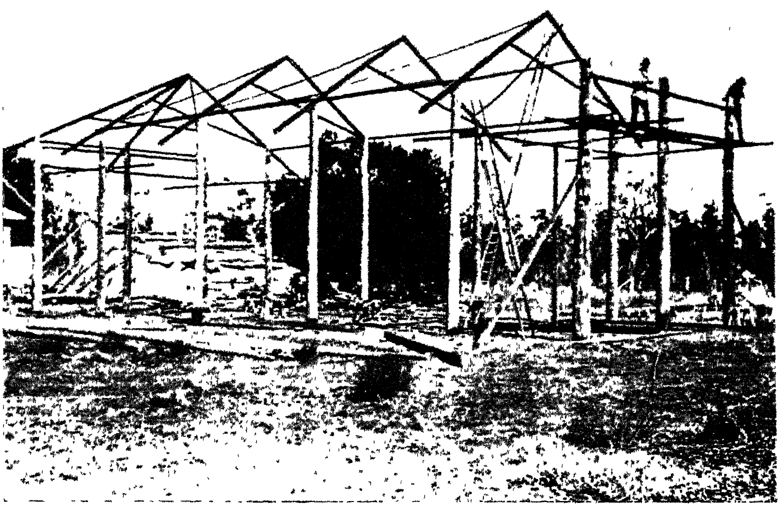
Later, when more ground is ready, it is proposed to conduct feeding-off trials with wheat, in order to ascertain when and under what conditions this practice is advisable, and other experiments will suggest themselves or be suggested to the Department. But perhaps the most important of all is a series of experiments to ascertain the most suitable type and depth of mulch for this hot, dry district. Cultural practice throughout the world is founded largely upon results of experiments at the Rothamsted and other British stations, and the field investigations of King, of Wisconsin, and Hilgard, of California, U.S.A. None of these places are comparable to Nyngan, nor, indeed, to most of our dry, hot districts. How far can the results of these tests, so carefully conducted and so ably expounded, be applied to Australian agriculture, and what modifications are necessary to obtain best results? It is expected that the plots at Nyngan will answer these questions, and perhaps furnish the basis upon which a purely Australian system of farming may be founded.

This Year's Work.

It has not been possible to have the whole of the cultivation area ready for the plough this season, and it will probably be several years before the

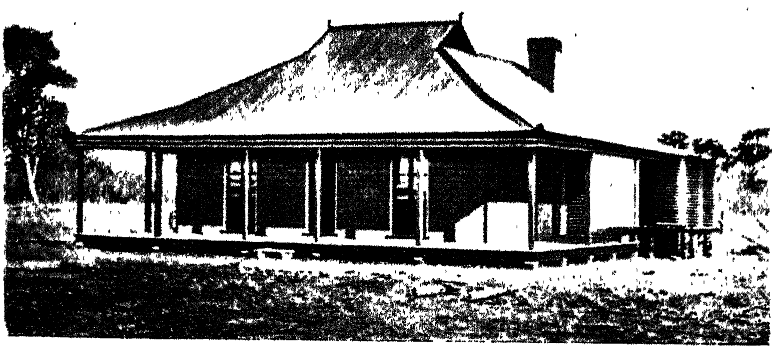


Harrowing after rolling, Experiment Plots, Nyngan Demonstration Farm.



Hay-shed, removed from Coolabah, being re-erected at Nyngan Demonstration Farm.

Uncleared land at Nyngan Demonstration Farm.



Acting Manager's Cottage, Nyngan Demonstration Farm.

rotation outlined will be in full swing. Areas totalling about 180 acres have been ploughed, and 120 acres of wheat have been planted, in addition to one paddock of fallow crop.

The wheat has been sown this year in land which was only broken up a couple of months before planting. It was worked down to the required tilth, but, inasmuch as no rain whatever fell between ploughing and sowing, the seed had to be placed in a dry seed-bed, and could only germinate when rain fell after sowing.

Before the 9th May of this year, there was a period of 51 days during which no rain fell; and preceding that period only 28 points of rain, distributed in four falls, were received in 36 days; so that in 87 days only 28 points of rain fell, and that was in quantities too small to be of any benefit.

At the end of April the wheat was up in small patches only, where a little moisture had been retained in the ground owing to proximity to trees which had been removed in clearing. Decayed leaves around the base of the tree would form a certain amount of moisture-retaining humus, and the dirt thrown back in clearing would keep the ground mulched until it was levelled for ploughing. Both causes probably combined to ensure a small percentage of germination.

Up to the end of April, then, the Nyngan crops were doomed to failure. The average rainfall for February, March, and April is 578 points, but only 28 points had been received. This is an illustration of the difficulties which beset agriculture in western New South Wales. In Riverina, the Victorian mallee, or South Australia, farmers could face even this state of affairs with equanimity, and rely confidently upon the winter rains to save the crop. But the West Bogan is a land of summer rain, and the summer was gone. Surely scientific principles must be put into practice if success is to be achieved under such conditions. The largest heart in the west will break if it does not beat under a long head.

Fortunately for this crop, rain fell in May. On the 10th, 11th, and 12th of that month 59 points were registered, and again on the 17th, 75 points fell, making a total of 134 points. Mr. Kelly had the ground in a proper state to receive this rain, so that the wheat on the 120 acres came up well. Lighter rains followed, making an additional total of 97 points by 19th June. Further good falls were received on the 7th July and following days, which will carry the crops well into August. As stated above, fallowing was impossible this year, and Western pioneer farmers will often have to take a similar risk or lose a season. But they should bring about a more reliable set of conditions as soon as lies in their utmost power. No crop will go in again on Nyngan Demonstration Farm without being preceded by a summer fallow.

Before the July rains came, the crops were looking well, in some instances covering the ground, and with sufficient growth to carry five or more sheep to the acre for a month. Mr. Kelly points out that in dry seasons like that just experienced, especially when such heavy frosts have occurred, pasture

for ewes and lambs is hard to procure; and in case a wheat-and-sheep man did not care to risk his crop coming to maturity, it might pay him better to feed his sheep upon the crop than to remove them long distances to pasture. Of course a progressive farmer would grow fodder crops for winter feed for his ewes, but the wheat might be used as a last resort in extreme cases. This shows that there is a greater certainty of profitable return than is generally supposed. But Nyngan Farm's first crop gives every indication of reaching at least the hay stage; and in future years, with rotation and fallowing, it will be a very dry season indeed which will justify the feeding-off of the wheat.

The experiments actually planted are the variety trial with wheats; the thick and thin seeding experiment; the ploughing experiment; and the fertiliser trials in the first stage. These are the points upon which it is considered that information is mostly urgently needed, and they are the only experiments for which the land was ready.

In sowing wheat this year, the practice of rolling and harrowing after sowing has been adopted. The former operation was performed with the object of compacting the earth around the seed, and the latter to re-form the mulch. Mr. Sutton is of opinion that both these operations could be avoided by the use of some modification of the ordinary disc or hoe drill to compress the earth above the seed. The "Shoe-heel Drill" recommended in Mr. W. H. Campbell's "Manual of Soil Culture," or one similar in principle, would meet the requirement. But at the time of sowing no such implement was available.

The buildings already erected on the Farm are manager's cottage, two workmen's cottages, stables (partially completed), and hayshed. The last-named was in use at Coolabah Farm, but was dismantled and re-erected at Nyngan.

In an endeavour to obtain a supply of fresh water near the homestead, a bore was sunk to a depth of 260 feet, but only salt water was struck. A splendid tank of 5,000 cubic yards was excavated by contract on the opposite side of the railway line, where good catchment was available, and water will be pumped from this to the buildings. But until the tank is filled and the pipes laid, water for working horses has to be carted $2\frac{1}{2}$ miles. This is a great handicap, as it takes men and horses from other farm work and delays the operations.

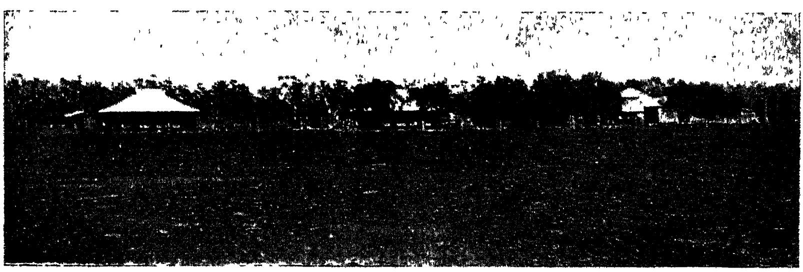
Mr. Kelly recently again tested the water in the bore, and found it still salt. It rises to within 70 feet of the surface. At the bottom of the bore, besides being salt it is very slimy. The surface is clearer.

Much of the country between the Bogan and Darling Rivers may be suitable for irrigation, but two factors will operate against its successful introduction on a large scale. Damming back the head waters of the rivers will be expensive, as the country and catchment do not offer the unique advantages of Burrinjuck. Moreover, it would be very difficult to induce people who are used to large areas, and who regard a distance of 50 miles as "just over there," to take to this form of agriculture. Back-country men,

desirous of advancing those health-giving plains, and feeling the truth of what Dr. Jensen has so simply expressed, are apt to vigorously advocate conservation of water as the only element required. This is probably true; but irrigation means small areas and intense cultivation; hard work in wet paddocks under a hot sun; a complete change from all the conditions to which the people are accustomed. Here, even more than in Riverina, the introduction of large irrigation schemes would need to be accompanied by the immigration of people trained to that class of farming.

Sheep and wheat appeal strongly to Australian sentiment—the intermingling of east and west—the combination of the two products which have made the history of our country. This is the natural development of the central west. Suitable fodder crops follow as an essential element. Lucerne, the king of fodders, is slowly adapting itself to our dry conditions, and may yet be grown without irrigation on the far side of the Bogan. Experiments on a small scale are to be made at Nyngan.

The Department therefore invites public attention to the demonstration work at Nyngan Farm. Mr. Sutton was quite confident that it would be successful; but whether or no, it will be an organised attempt to bring science and practice to bear upon the problem of closer settlement upon our arid western lands.



Farm buildings, and first land broken up, Nyngan Demonstration Farm.

ERADICATING NUT GRASS.

THE best method depends upon the size of the area from which the grass has to be eradicated. For small areas, spray with arsenite of soda at the rate of 1 lb. of the chemical to 10 gallons of water. Care must be taken in using this solution, to see that live stock are not allowed to graze where it has been applied until the poison has been washed off by rain.

For larger areas, a good plan is to grow crops in drills and cultivate between the drills during the hot dry weather. Nut grass will not thrive if it is prevented from seeding, and frequent cultivation will, therefore, destroy it. Another good plan is to smother it by sowing broadcast strong-growing fodder crops.—GEO. VALDER.

A Foot Affection, commonly termed "Foot-rot," affecting Dairy Cattle.

Frequently of late, the advice of the Stock Branch, Department of Agriculture, has been sought by dairy-farmers in regard to a lameness—more especially amongst their milking cows—due to a foot affection, and which is usually termed by them "Foot-rot."

This condition is not at all uncommon, being most prevalent during wet seasons. It is largely induced by the animals continually standing in moisture, and by allied influences. Cases should be taken in hand immediately they are observed, or else serious trouble may be apprehended, as the sensitive portions of the foot become inflamed; and these being confined in a horny box, the pain is very acute, and only relieved by swelling of the parts above. As soon as a cow is noticed to be limping, even slightly, she should be bailed up, the affected foot thoroughly examined and cleansed, and the parts should undergo a fomentation with hot water two or three times daily for a quarter of an hour at a time. Careful search should be made for any small stones or twigs, or any foreign body likely to have caused injury. After thoroughly cleansing and drying the affected parts, they should be dressed with one of the following mixtures:—

(1)	Powdered boracic acid ...	1 part.
	Stockholm tar ...	4 parts.
(2)	Carbolic acid ...	1 part.
	Stockholm tar ...	10 parts.
(3)	Finely powdered bluestone ...	1 part.
	Powdered chalk ...	4 parts;

The foot should also be protected by a clean linen bandage.

Cleansing the foot should be carried out without any rough usage or violence to the parts, as is sometimes done by careless and unthinking persons. This disease is aggravated by dirty, rough, and stony yards; so if yards are drained, paved, and kept as clean as possible, the affection can be considerably minimised.

The skin-cracks at the back of the pastern and just above the hoof should be dressed with an ointment composed as follows:—

Acetate of lead ...	6 drams.
Carbolic acid ...	1 dram.
Vaseline ...	6 ounces;

the dressing to be repeated daily for as long as may be necessary.

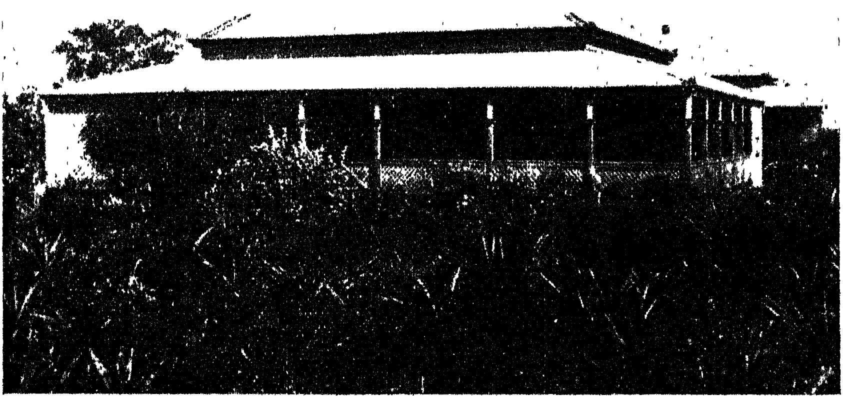
Whilst animals are under treatment, they should be kept in a home paddock, so as to be handy for treatment, and not have to travel far for their food and water, and the drier the paddock the better the results which may be expected.

The necessity for very early measures being taken in this affection is again very strongly emphasised, as otherwise such an amount of structural alteration results in the foot and adjoining parts as to render the animal not only lame, but oftentimes badly deformed for life. In chronic and neglected cases, it is sometimes of benefit to apply a blister, such as James' preparation, which is usually stocked by most chemists.—S. T. D. Symons, Chief Inspector of Stock.

An Advanced Dairy Farmer.

M. A. O'CALLAGHAN.

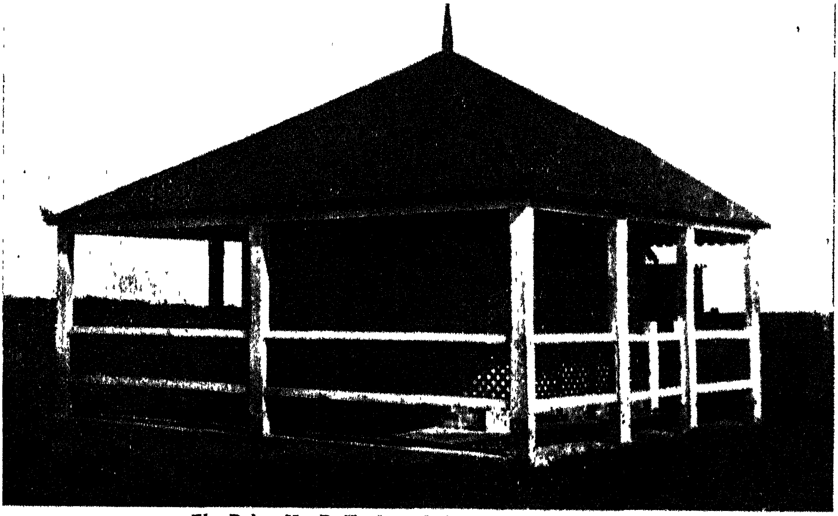
AT Lennox Head, near Ballina, Mr. E. Henderson has a nice property, of the usual Richmond River chocolate soil, on which he milks a large herd of cows; but, unlike the average dairy farmer, Mr. Henderson is not satisfied with merely making money out of the industry. He believes in housing himself well, and in establishing a home of which he may be proud. He also believes in having everything on the dairy farm so up-to-date that there will be no difficulty in maintaining the highest degree of cleanliness, and at the same time avoiding all unnecessary labour.



The Dwelling-house, Mr. E. Henderson's dairy farm, Lennox Head.

Recently Mr. Henderson added to the value of his herd by the purchase of a very high-class Jersey bull from the Department of Agriculture, namely, Berry Melbourne, by Melbourne (imp.) from that great cow Rum Omelette (imp.). This breeding indicates the quality of the sire selected by Mr. Henderson; but in animal breeding one can never tell the value of a sire until tried, and it will no doubt be very comforting for Mr. Henderson to know that at the last Sydney Royal Show the Department of Agriculture refused one hundred guineas, which was offered by two farmers who live by the industry, for a son of Berry Melbourne from that good cow Lady Tidy. I refer to the young bull Best Blood. The Department declined to sell, as they did not wish to part with this family, having already sold the sire to Mr. Henderson.

Berry Melbourne is considerably like a bull imported last year by Mr. Samuel Hordern, namely, Champion of St. Peters, an animal which obtained the highest award at the Royal Show of England, 1910.



The Dairy, Mr. E. Henderson's dairy farm, Lennox Head.

It will perhaps serve as a stimulus to other farmers to do likewise when they see the type of house, milking bails, and dairy illustrated, which have been erected by Mr. Henderson. It will be seen that the milking machine has been installed on the farm, and it is pleasing to be able to state that, thanks to close attention, the machines are being satisfactorily worked, and Mr. Henderson usually obtains the highest grade for his cream. If all the dairy farmers who could afford it erected premises of this type, there would be more comfort in dairying, and there would be less desire to sell the farm and seek a new home elsewhere. In this way a more settled and happy condition of things would prevail; and, with the outhouses of the character herein illustrated, there would be very little drudgery attached to the industry, which would become much more attractive to the younger members of the family.

Milking-machines at work, Mr. E. Henderson's dairy farm, Lennox Head.

Pork and Artichokes.

At the Hawkesbury Agricultural College they have an acre of sandy loam which was planted with Jerusalem artichokes several years ago. In April every year they bring a portable pig-house on to the ground, and sixty young pigs are turned in to root out the tubers. The pigs do this willingly, and put on 1 lb. per head per day for six weeks. At the same time they manure the ground with their excreta. They are taken off before they have devoured all the tubers, because a few are required as seed for next crop. The ground is cultivated, being already sown with the remnants of the crop. The pigs are sent to market, when it is found that the acre of artichokes has produced over a ton of pork, worth about £50.

The above reminds us of the gentleman (American, of course) who discovered that rats breed faster than cats, and established a large cat-skin farm. An equal number of cats and rats were turned into an enclosure. The cats kept down the surplus rats, whilst after the periodical harvest of cat-skins, the carcases were thrown back as food for the rats; and so on for ever.

But the artichoke yarn is quite true. Any reader can go to the College and see the work in progress; and, moreover, if he is a pig-breeder, he can repeat it himself on a waste corner of his farm.

Perennial Red Clover.

"D.M.," North Dorrigo, inquires as to the best soil and climate for Perennial Red Clover. He has red chocolate soil, very rich, and also nice dark forest soil.

As a rule Red Clover gives the best results when sown on a medium loam, such as most of our chocolate soils. It should, however, give very satisfactory results on the dark forest soil. The seed should be sown in the autumn at the same time as cereals. It can be sown alone, or with a cover crop, such as oats or barley. In most of our cool districts it has given excellent results, and being such a splendid fodder as well as a soil renovator, its growth should be encouraged. Sow from 8 to 12 lb. per acre alone, or 2 to 4 lb. with a cover crop. In good seasons a spring sowing might also be tried.—Geo. Valder.

Transporting Farm Machinery through Narrow Gateways.

Mr. J. Clark, of Dapper, brought to my notice recently a simple contrivance for transporting a grain drill from one paddock to another, when the gateway is too narrow to haul it through with the horses yoked up ready for drilling. Cut two saplings, 6 inches in diameter, and both longer than the width of the drill. Bolt the two together, about 1 foot apart. Draw the drill on to this sledge, and attach a horse to end of the sledge, then raise the shafts of the drill to clear the gate-posts, and haul the sledge carrying the drill sideways through the gateway.—Mark H. Reynolds, Inspector.

Silos at Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

Tub Silo.

IN April, 1902, a tub silo of about 90 tons capacity was erected at this Farm. During the past nine years it has been filled several times with chopped maize stalks and sorghum. Foi probably half of the period it was empty, and during the other half it contained silage. It was built of 2½-inch Oregon planks, grooved to allow of a fillet between to practically exclude air. After nine years the condition of the timber is not satisfactory, many of the planks being decayed 3 to 4 feet from the bottom. From present appearances, the life of this silo would be from ten to twelve years.

Fig. 1.—Cutting maize for ensilage, with string binder, Bathurst Experiment Farm.

Under the dry conditions obtaining at this Farm it was found that there was a considerable baking of the silage adjacent to the walls of the silo, due to the desiccating action of the sun and winds. Considerable waste from this cause was occasioned. For this reason this class of silo is not suitable for dry climates when silage is to be carried over for considerable periods. When used within a few months of making, the loss would not be so great.

A silo suitable for comparatively dry climates, such as the wheat-belt, is one upon which the drying effects of sun and winds are reduced to a minimum. This is more easily obtained by the cheaply-excavated pit, for, when filled, earth can be scooped upon the top to protect the silage.

Hillside Silo.

When the conformation of the land allows it, the hillside silo is practicable and possesses many advantages. Amongst these is the ease with which it can be filled, the silage being thrown downwards from the carts, and not lifted or elevated.

The silage is taken out with less labour than from the ordinary pit, as it is removed from the lower side of the hill. As the silage is below, or level with the surface, weighting material, such as earth, stones, &c., is economically applied, and the silage is protected from the sun and winds. The temporary end from which the silage is taken is not so exposed as if it were above the level of the surface.

Fig. 2.—Filling hillside silo, Bathurst Experiment Farm.

To take the place of the tub silo at this Farm, a hillside one was excavated. As expense is a very serious deterrent to silage-making, it was decided to do the work as economically as possible. Details of the expenditure are given.

The work was carried out during the winter months, or when horses and labour could be spared from the more urgent farm work. The students did most of the excavating by plough and scoops, as in tank-sinking. The sides were trimmed with the pick, and the bottom also squared where the plough could not work. After sinking several feet, the decomposed granite became very hard. Exposure to the air and rains for a month or so allowed of its being ploughed, and this intermittent work assisted in reducing the cost.

The excavation was carried 12 feet below the surface, and the earth taken out was placed 4 feet above, leaving the silo 16 feet deep. Upon this earth the teams were drawn when filling the silo.

Old railway sleepers were used to timber the sides, to keep the soil and loose earth in position. It was necessary to timber 11 feet, the granite of the remaining 5 feet being sufficiently firm not to require it. The sleepers were kept in position by hardwood uprights, sunk into the floor of the silo, and held in position by strong bolts 6 feet long, passing through them within 4 feet of the top and affixed to half sleepers, sunk as posts in the adjacent banks. These posts and bolts were covered over by the earth excavated to raise the walls.

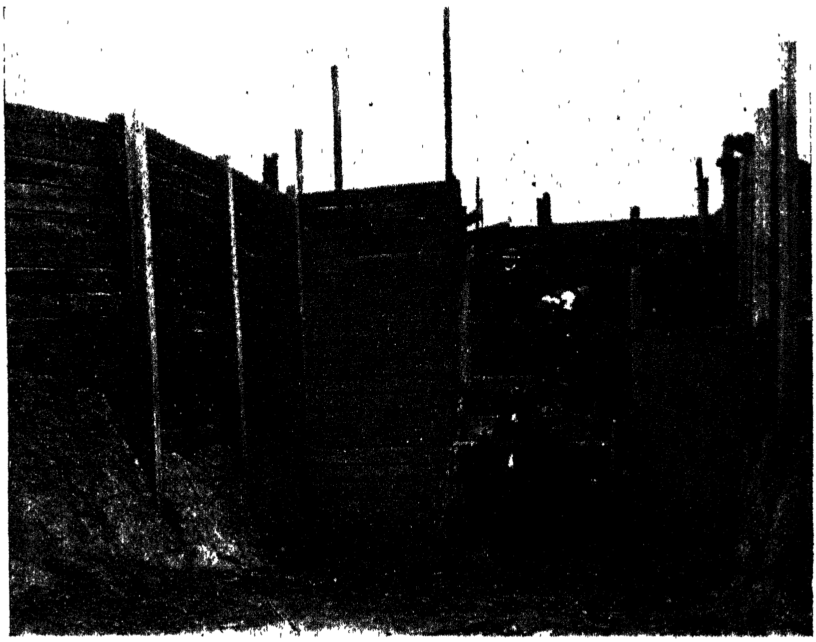
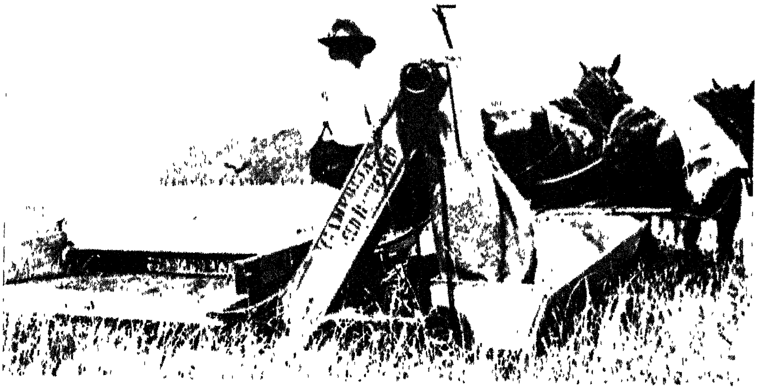


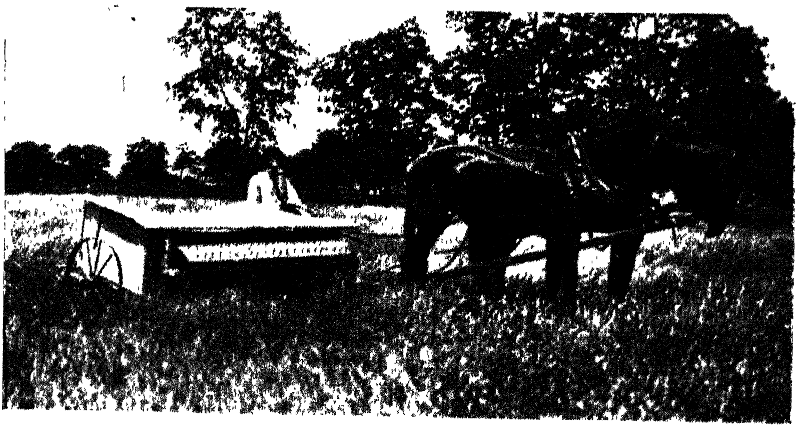
Fig. 3.—Removing silage from hillside silo, Bathurst Experiment Farm.

Other sleepers were used to protect the approach of the silo, when excavated, from falling in. A removable railing, 4 inches x 3 inches, was placed around as a guard when the silo was empty. The slope of the hillside was such as to allow of any water running off by means of a drain from the lowest portion.

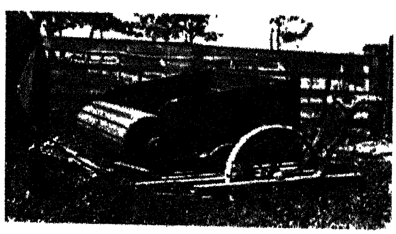
The dimensions of the silo are 36 by 20 feet (except at one end where it was contracted to 17 feet 6 inches, to allow of the 9 feet sleepers being butted at the corners to do away with the necessity for posts) and 16 feet deep. A fall of 1 foot in the 36 was allowed for drainage.

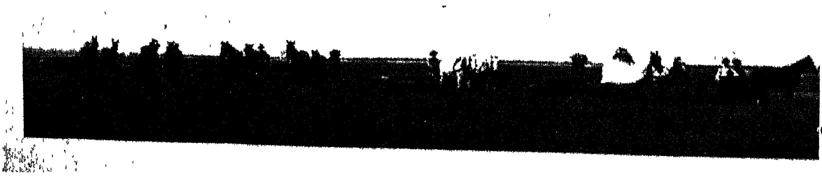
Estimating the weight of silage at 40 lb. per cubic foot, the capacity would be 198 tons. A temporary end was made of sleepers which could be placed so as to enclose but half the capacity as shown, or removed back according to the amount of fodder available.





Grass-seed - -
- - Harvesting
in the
United States.





Cost of Hillside Silo.

The cost of excavating is estimated at 9d. per cubic yard. It might be mentioned that considerable quantities of the gravel taken out were used in repairing and making roads.

	£	s.	d.
Excavating 970⅔ cubic yards, at 9d.... ...	36	8	0
11 hardwood posts, 18 ft. x 6 in. x 6 in. ...	8	19	4
5 " rails, 20 ft. x 4 in. x 3 in. ...	1	5	2
130 sleepers, 9 ft., for body of silo, at 1s. ...	6	10	0
50 " 8 ft., for false end, at 1s. 3d. ...	3	2	6
40 " 8 ft., for wings, at 1s. 3d. ...	2	10	0
Cartage from railway, £1 per 100	2	4	0
9 bolts, 6 ft. x ¾ in.	0	18	0
Labour, erecting posts and sleepers	8	0	0
" digging drain...	1	10	0
Total	£71	7	0

No arrangements have been made for any roofing, as in dry climates 1 foot or 18 inches of earth would be sufficient to absorb all excepting the very heavy rainfalls.

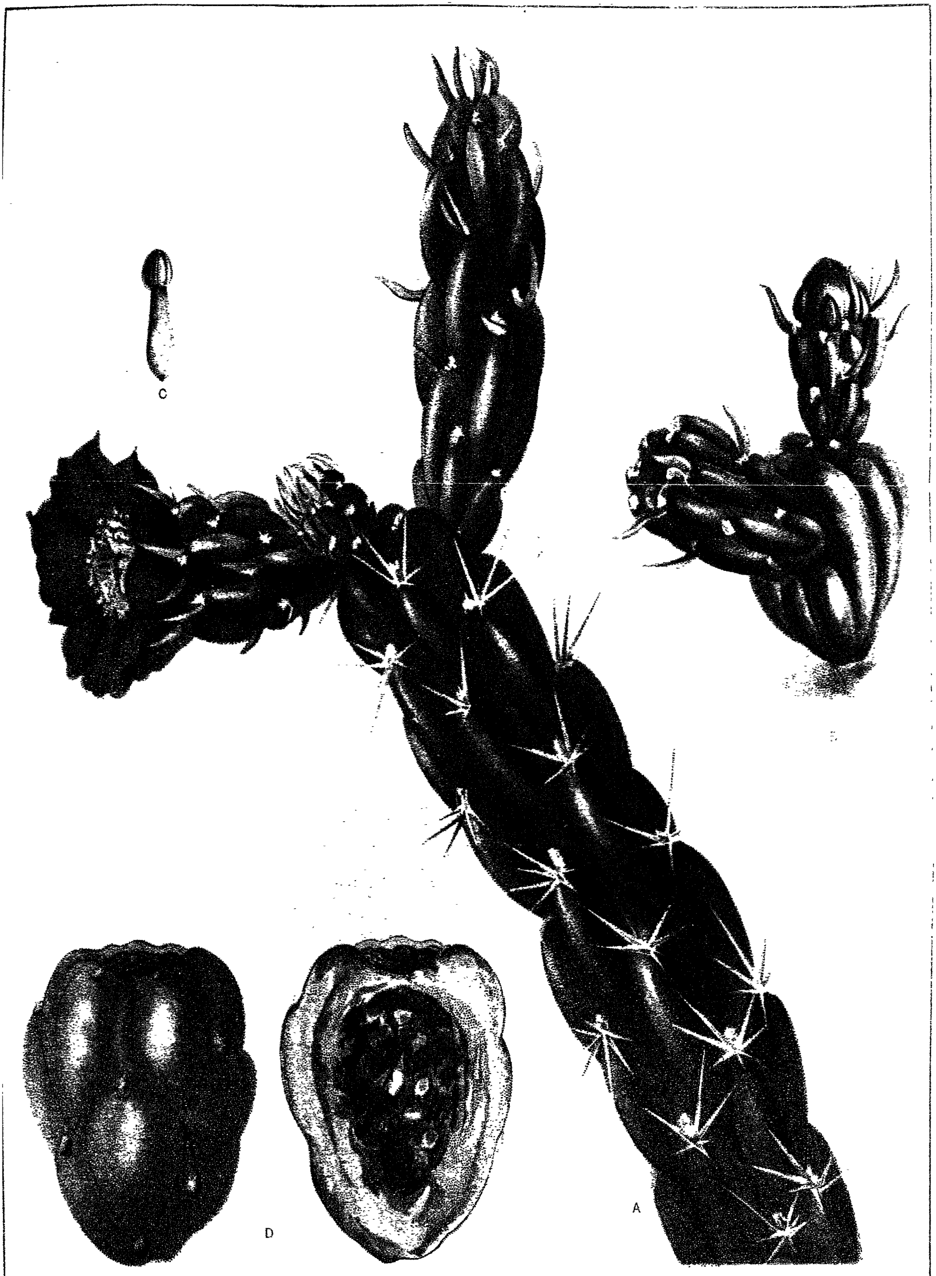
Over 80 tons of maize silage have been placed in a section of this silo with very satisfactory results as regards cost and waste. The cost was reduced by not chaffing it, as it was decided to test it in this way first. During next season the silage will be chaffed before going into the pit. When chaffed, there is less waste in feeding, and it is easier to remove from the silo. Against these advantages is the cost of handling and cutting.

The Harvesting of Grass-seed.

One of the greatest difficulties that the Department has met with in connection with the cultivation of the native grasses is in obtaining seed. The cost of gathering by hand is so high as to be practically prohibitive. Seed of native grasses is being offered at from 5s. to 8s. 6d. per lb., and as the rule is to sow something like 40 lb. per acre, it will be seen that, unless the price of seed can be cheapened, the cultivation of our valuable native grasses is not likely to make much headway.

Inquiry has lately been made in the United States and other countries with regard to the most up-to-date machines for gathering the seed. The illustrations given are taken from reports received from America.

The Department has already had seed of a number of native grasses gathered and sown in fairly large areas at the Experiment Farms. Once we have anything like a commercial area ready, and machinery to handle it, there is no reason why seed should not be supplied to buyers at much more moderate rates than those now prevailing.—Geo. Valder.



H. S. BURTON LITH

M. FLOCKTON DEL.
W. A. GULLICK, GOVERNMENT PRINTER

OPUNTIA IMBRICATA, P. DC.

The Prickly Pears of Interest to Australians.

[Continued from page 328.]

J. H. MAIDEN,

Government Botanist, and Director of the Botanic Gardens, Sydney.

No. II.

2. Opuntia imbricata, Haw.

I WILL introduce this particular prickly pear (red flowering ones are not common) with extracts from an official report made as recently as April of the present year.

> In accordance with your request of January last, I have the honour to forward you, per parcel post, this day, a specimen of the plant resembling prickly pear, growing on the ridges around Sofala.
>
> The plant, which is known locally as "Devil's Rope," is of the cactus order, and is said to have been introduced to this district as a flower-garden shrub, in the garden of the local parsonage.
>
> It is a hardy, vigorous grower, attaining a height of about 3 feet; it spreads rapidly, and shows a partiality to rough barren ridges.
>
> It produces a pear-shaped seed-pod, very similar to prickly pear; and, like the pear, is absolutely useless as a fodder plant, even pigs and goats refusing to touch it.
>
> Some of the ridges around Sofala are fairly thickly covered with it, and I am informed that the plant is becoming prevalent along the river so far as Turondale.—WALTER W. E. POPE, C.P. Inspector.

The above report was made to the then District Surveyor at Orange, who writes:—

> With an extensive knowledge of this State, I have not noticed this plant growing anywhere but at Sofala, where these specimens were obtained. It appeared to me probable that it would rapidly become a nuisance. Its eradication could be effected at comparatively small cost now.—WILLIAM M. THOMAS.

Last year Mr. R. H. Cambage and I were spending a short holiday in the Sofala district, and the plant now figured was gathered at a coach-horse changing place about midway between Bathurst and Sofala. With a full knowledge of the seriousness of this post, and with the exercise of every caution, I failed to get my specimens without shaking some spinules on to my clothes, and was reminded of the trip for nearly a fortnight in consequence. I also stepped on to one of the spines, which went completely through the boot-upper and drew blood. I mention this to show that it is a plant which can protect itself, and that it is not to be trifled with.

Mr. W. D. Filmer some years ago told me that it had been cultivated at Temple Court, Murrurundi, and that there is a lot in the bush at the back of the garden; that it is in odd places in the bush near watercourses, and is undoubtedly getting a hold around Murrurundi. He also reports it from Willow Tree. I have found it at Warialda and Scone, big plants of it, and escaping into the bush.

I have seen it wild in other places, but do not remember where. I do not, however, recollect having seen it except in places with moderately cool

winters. It prefers the tablelands. In every case it has been cultivated, usually as a verandah plant, for it is decidedly an ornament in a dry verandah, where it is scarcely ever watered or given the slightest care. Then a bit of it is thrown out, and the mischief begins.

Very little is known of this species in Australia, so I give extracts from two bulletins by David Griffiths and R. F. Hare, who have done splendid work in spreading a knowledge of Opuntias.

Opuntia imbricata (Haw.), DC.* Prodromus iii, 47, 1828. *Cereus imbricatus* (Haw.) Rev. Pl. Suc., p. 70, 1821. Tuna Juell (Whae).

This is the common *Cylindropuntia* of the highland region of Mexico. The fruit is not eaten by either man or beast, so far as we have been able to determine. As the analyses show, it is very high in acid, and because of this and the presence of so much plant mucilage and absence of sugar, it is not at all palatable.

Before the advent of the coal-tar dyes into Mexico, this fruit had an important place in the arts. The tunas were gathered, chopped up into small pieces, and boiled, the fibre and seed being filtered out and the extract used to dissolve and set cochineal dye. It is still used in this way to a limited extent. Experiments which we have conducted show it to be somewhat efficient for the purpose, especially in the colouring of woollen cloth. Its mordanting property is doubtless due to the large amount of acids and salts of organic acids present.

This is the only analysis of cane cactus (*Cylindropuntia*) included in this bulletin. The fruits of this group of the cacti are not edible, nor was this particular sample. The analysis was made to determine its composition compared to the prickly pears. The fruits average 51·66 grams in weight. The percentage of seed is 9·68, which is higher than was found in any of the fruits except *O. phæacantha* (8022).

The total solids were only 7·57 per cent., 5·54 per cent. being soluble in water. The juice contained an unusually large amount of plant mucilage, which rendered it so slimy that we could not determine the specific gravity at all by means of a Westphal balance, and upon attempting this determination with a gravity balance, the unavoidable bubbles in the slimy juice caused the specific gravity to be only ·903, or less than water, which is, of course, too low. The proteids present were about an average of what is usually found in the other tunas. The fruit contains 3·48 per cent. of acid, which was found to be malic acid. The large percentage suggests a possibility of the use of the plant for the preparation of this acid. No trace of sugar was found either by reduction or polarimetric methods.

An analysis of the ash of the soluble solids in this fruit is given below. A comparison of its composition with the composition of the ashes of the stems of the cacti as given in Bulletin No. 60, Table No. 2, New Mexico Experiment Station, shows it to be comparatively low in lime and high in alkali, salts, and sulphates.

Composition of the ash in the soluble solids.

Silica, iron, and alumina (SiO_2, Fe_2O_3, Al_2O_3)	·64	per cent.
Chlorine (Cl)	4·09	,,
Sulphuric acid radicle (SO_4)	5·12	,,
Calcium (Ca)...	7·15	,,
Magnesium (Mg)	6·83	,,
Sodium (Na)	trace.	
Potassium (K)	33·81	,,

Collected at San Luis Potosi, Mexico, 9th August, 1905.

Coconoxtle, Cardenche, Tuna Juell.

An open branching shrub, 5 to 10 feet high, with a trunk 3 to 5 inches in diameter; joints cylindrical, oval, very variable in length and diameter, 1 to 2 by 3 to 12 inches: prominently tuberculate with tubercles compressed, ⅜ to ½ inch wide by 1½ inch long at base, and ½ inch high, the furrows between the tubercles being distinctly marked by a dark green line, upper and lower curvature of crests equal; leaves ⅜ inch long, ⅛ inch in greatest diameter at base, subulate, cuspidate; areoles oval by 5/16 to ⅜ inch long, tawny, increasing in size with age; wool, tawny; spicules yellowish, 1/16 inch or more long; spines white or yellowish, divergent in all directions, the most prominent centrally located in lower part of areole, about 1 inch long, with smaller ones surrounding it,

*See Bulletin 60: 97, Pl. VII, fig. 2, 1906, New Mexico Station.

largest one completely and loosely tunicate, with white glistening sheaths, but the smaller only partially sheathed with close-fitting covering, five to ten in number on younger joints, increasing to twenty or more on 2 and 3-year-old wood; flowers purple, with reddish-purple style, chocolate-coloured filaments, and six or seven parted yellowish-white stigma; fruit oval to subglobose, remaining attached to trees three to five years, and continuing to develop to 2 inches in diameter, green, at first tuberculate, but nearly smooth later, and russet after two or three years old.

This is one of the common characteristic cylindrical-jointed species of the plateau region of Mexico. It is a conspicuous plant from San Luis Potosi to Gutierrez and southward.

Like *Opuntia fulgida*, the fruit remains attached to the trees in this species for several years. One has no difficulty, however, in recognising fruits one, two, or three years old by their general appearance. The younger ones are always smaller, more tuberculate, and depressed at the apex. One will usually find a series of sizes, indicating the different years' growths. Stock do not appear to disturb the fruit in the open country, but the natives singe the plant with brush and feed it.*

EXPLANATION OF PLATE.

Opuntia imbricata.

A. Flowering branch.
B. Monstrous fruits, showing extension and ramification of the succulent floral axis. (Fruit upon fruit.)
C. Style and stigma.
D. Fruit showing outside surface, and also vertical section.

Hawthorn Hedges.

"S.D.," Mittagong, tried to grow a hawthorn hedge around his orchard, but the seed failed to grow. He asks if the Department can recommend another hedge.

Mr. J. H. Maiden, Government Botanist, replies:—

A hawthorn hedge is easiest formed by feeding the haws to pigs, collecting the manure and planting it in the trench in which it is desired to form the hedge. By this treatment every seed usually grows.

A useful hedge for Mittagong would be privet of any kind. The botanical name is *Ligustrum*. *Crataegus pyracantha* is also a useful hedge.

A Useful Grass for Bore-water Areas.

The Hon. James Ashton, M.L.C., has drawn attention to the great value of Giant Couch Grass in Queensland where bore-water is available. The grass in question is a Brazilian one, is often known as Para Grass, and is known to botanists as *Panicum barbinode*, Trin. Given warm situations with plenty of water, it grows luxuriantly and is eaten voraciously by all classes of stock, to the practical neglect of all other grasses in the vicinity.

I would suggest that it be given a thorough trial in the vicinity of the warmer artesian bores in New South Wales. Although it is not likely to be as robust as in certain Queensland localities, where it is fairly well known, it is still likely to yield bulky useful fodder.—J. H. Maiden.

* Prickly Pear and other Cacti as Food for Stock, II. (Bulletin No. 64, New Mexico Experiment Station.)

The Soils of the Armidale District and of Tenterfield.

H. I. JENSEN, D.Sc., Chemist's Branch.

THE New England district is usually regarded as worth only slight consideration from the agricultural point of view. This may be partly due to the fact that it is long been known as a mineral field, and farmers know that, generally speaking, good mineral districts are poor agricultural districts. Partly it may be due to the fact that New England has a climate which is unsuited for the crops with the cultivation of which Australian agriculturists are most familiar. The main reason why New England has been avoided by the agriculturist is, however, that all the best land in proximity to the railway line and public highways was taken up years ago in large holdings for sheep and cattle stations, and consequently it has been hard to get any at a reasonable figure for farming purposes.

It is nevertheless a fact that New England has rich soils predominating altogether, and only small areas of really poor soils. The climate being cold in winter, it follows that such crops as maize, sugar, and citrus fruits cannot be seriously considered. The rainfall curve being of the Queensland type, the varieties of wheat which suit our interior are not adapted for New England. Very late rust-resisting wheats should do well. Tasmanian fruits and potatoes are excellently adapted for New England, which, indeed, is the Tasmania of New South Wales. Barley, rye, and oats are crops which do well in this district, and also lucerne, where the soil is deep, moist, and loose.

The New England tableland varies in altitude from 1,500 to 5,000 feet—the elevation of Tamworth, on the slopes, being 1,279 feet; Armidale, 3,265; and Tenterfield, 2,831 feet. The following table gives the average rainfall of Armidale and Tenterfield for each month of the year:—

	ARMIDALE.	TENTERFIELD.
	inches.	inches.
January	4·38	5·46
February	2·82	4·78
March...	2·46	4·14
April	2·18	2·50
May	1·87	2·04
June	2·25	2·47
July	1·88	2·34
August	1·95	1·74
September	2·52	2·09
October	2·83	2·50
November	3·15	3·06
December	3·67	4·17
Yearly Average ...	31·96	37·29

The geology of the New England tableland is only very imperfectly mapped, so that to base a soil map of the Armidale district on the geological map would be very misleading, whilst to make a proper geological soil survey would take a longer time than I have been able to devote to the work. The map accompanying this report is therefore very crude, and can only be taken to express broad general features.

Geology.

A glance at the geological map of New South Wales shows that about half of the New England tableland consists of granite, and the rest is marked basalt and Silurian. The country marked provisionally Silurian is highly folded, contorted, and metamorphosed, and has for that reason been assigned to the Silurian, but more and more evidence appears to be forthcoming that it is in reality not as old, and probably consists of highly metamorphosed Permo-Carboniferous sediments. Whatever the age may be, the disturbance of the stratification by earth movements is so pronounced that the metamorphic rocks change in character very rapidly, and the different strata which outcrop in quick succession give very different soils, varying from the poorest to fairly rich types. Tuffs, lavas, limestones, quartzites, black slates, cherts, and siliceous slates all occur in the formation. Here and there basalts have burst through and flowed over the top. The variability of the soils of the metamorphic rocks, therefore, makes it a hopeless task to discuss them, except in general terms.

The granites of New England are very variable in nature. The tin granites are very acid, containing over 75 per cent. of silica, but do not cover more than a small fraction of the area. They yield very poor soils.

Most of the New England granites contain less than 70 per cent. of silica, and are dioritic in affinity, containing much of the lime minerals, hornblende, and plagioclase felspar. These granites yield fairly good soils. Different varieties of them are distinguished by different names; so we have the blue granite (or granite-porphyry), a very widespread type, yielding good soil; the Uralla granite, a more coarse-grained type, yielding fair soil; and the Moonbi granite. Thus in analyses of granites given in Andrews and Card's paper on New England petrology, we find the coarse, acid tin-granite ranging from 73 to 76 per cent. silica; the Tenterfield blue granite 65·36 per cent.; the sphene-diorite porphyry (Moonbi and Wilson's Downfall type), 69·14 and 64·20 per cent.; Hillgrove granite, 69·55 per cent. silica; and so forth.

The soils yielded by these various granite types are also briefly described by Andrews, with economic notes on the timbers. The following are extracts from "New England Geology," Part IV (Andrews):—

THE BLUE GRANITE—*Economic notes*—Park-like land, covered with *Eucalyptus viminalis*, *E. coriacea*, *E. nova-anglica*, *E. conica* and *angophora intermedia*, characterise this igneous mass in the central plateau. The gentle undulations of the country allow of its ready cultivation. Its chocolate soil also fits it for general farming. It thus stands out in marked contrast to the surrounding hills of barren acid granite. No minerals of commercial value are genetically connected with this rock.

The localities as enumerated by Andrews, where blue granite is the dominant formation, are Boonoo Boonoo, Tenterfield, Ballandean (Queensland), Cataract River, Bolivia, Emmaville, Tent Hill and Dundee.

SPHENE-DIORITE-PORPHYRY—*Localities*—Wilson's Downfall, Ruby Creek, Wallangarra, Undercliffe, the Drake-Tenterfield Road, Malarra, and Bolivia in Northern New England; also at Moonbi and Walcha Road, 150 miles south of the northern development.

Economic Notes—The magnificent appearance of this rock would secure for it a place even among the standard ornamental granites of the world. No ore deposits of commercial importance appear to be genetically associated with it. On the tableland it forms undulating country of sandy nature, well grassed and of park-like character. The characteristic tree-growths are *Eucalyptus viminalis*, *E. cornea*, *E. tereticornis*, and *Angophora subvelutina*. It is well adapted for grazing and for orchards.

COARSE ACID GRANITES—*Localities*—Tenterfield, Boonoo Boonoo, Kingsgate, Mole Tableland. Rivertree, Boorook, Sandy Hills, Carrai, Yulgilbar, Enmore, Bolivia, The Gulf (Emmaville), Bald Knob (Glen Innes), Glen Elgin, Guy Fawkes, Inverell, Giant's Den and Bendemeer.

Economic Notes—The soil is extremely sandy, and of but little use for cultivation purposes. Its rugged topography also renders it of little use for other than rough grazing purposes. The selector avoids it as being the home of dogwood (*Jacksonia scoparia*), black oak (*Casuarina suberosa*), cabbage gum (*Eucalyptus brevifolia*), stringybark (*E. macrorhynca*), *E. rubida*, white peppermint (*E. Sturtiana*), honeysuckle (*Banksia*), and silver wattle (*Acacia nereifolia*).

The areas dealt with in this report comprise Tenterfield, within a radius of 2 miles from the town, and Armidale district, within a radius of 12 miles of Armidale.

At Tenterfield, the area examined consists mainly of typical blue granite, though parts of it contain small intrusions of the more acid porphyritic micro-granite. In the Armidale region two granite types obtain. At Gera Station a biotitic granite, not unlike Andrews' Hillgrove type, occurs as a large and extensive stock, and at Tilbuster a granite, porphyritic in felspar and not unlike sphene-diorite-porphyry, forms another extensive mass. Both belong to the basic type of granites, and although the soils are sandy they form good grass land and are well fitted for orchards.

TENTERFIELD SOILS.

The Tenterfield soils, of which the analyses are given in Table I, are typical of the district and of the whole blue granite area of New England. Numerous farmers' soils from this area, analysed by the Department, all give analyses differing from the above only in a slight degree.

They are not rich soils. In phosphoric acid they are particularly weak. The potash percentage is very satisfactory where the soil overlies rotten granite *in situ*, but on alluvial patches and where much leaching has taken place the potash is reduced correspondingly. Volatile organic matter and nitrogen are low in amount, but the mechanical condition is very satisfactory, and nitrification must proceed with great rapidity. The subsoil is generally of a loose friable nature, and gradually merges into decomposed rock.

TABLE I.—Composition of some Tenterfield Soils.

Formation	Nature	Depth.	Subsoil.	Reaction.	Water Capacity.	Capillary Power.	Moisture.	Volatile.	Nitrogen	Lime.	Potash.	Phosphoric Acid.
Alluvial derived from blue granite	Heavy black loam	inches. 12 to 18...	Clay ...	Very faintly acid.	p. cent. 32 Low.	inches. 9¼ Excellent.	p. cent. 1·45	p. cent. 4·75	p. cent. ·042	p. cent. ·295	p. cent ·063	p. cent. ·036
Blue granite	Light loam	12 and over.	Loam...	Acid ...	34 Low.	over 10 Excellent.	1·61	5·39	·098	·168	·230	·050
Blue granite	Light brown loam	12 and over.	Loam...	Acid ..	35 Low.	over 10 Excellent.	1·40	5·06	·056	·242	·160	·064
Porphyritic micro-granite	Light brown loam.	12 or less.	Stony	Acid ...	34 Low.	9¼ Excellent.	1·25	3·75	·098	·244	·249	·073

TABLE II.—Some Typical Granite Soils of the Armidale District.

No.	Locality.	Formation.	Nature.	Depth.	Subsoil.	Reaction.	Water Capacity.	Capillary Power.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Class
VII	Gera Station, about 11 miles from Armidale.	Hornblende-biotite-granite.	Light grey; sandy loam.	inches. 12	Gravelly, loose	Acid ..	per cent. 32 Low.	inches. 10 Excellent	per ct. 1·00	per ct. 4·62	per ct. ·070	per ct. ·186	per ct. ·104	per ct. ·074	2nd.
VIII	Castledoyle, 5 or 6 miles from Armidale.	Wash, mainly off granite	Dark; clayey loam.	18	Clay	Strongly acid.	42 Fair.	10 Excellent	1 97	6·65	140	·240	·129	·077	2nd.
XIII	7 miles from Armidale, Guyra-road.	Coarse granite ..	Light grey; sandy loam.	12 to 24	Sandy	Acid ..	32 Low.	10 Excellent	·31	1·44	·023	·050	·032	·033	3rd.
XV	Tilbuster, 4 or 6 miles from Armidale.	Granite (wash and drift).	Brown loam ..	Many feet.	Loam	Acid ..	35 Fair.	6 Good.	1·22	5·07	·070	·239	·159	·074	1st.
III	Flat on Commissioners' Waters, 4½ miles from Armidale, Hillgrove-rd.	Alluvial from granite.	Dark brown loam.	inches. 10	Peaty clay, then micaceous loam.	Very faintly acid.	39 Fair.	10 Excellent	1·00	4 50	·082	·246	·200	·114	1st.
I	Gera-road, 2¾ miles from Armidale.	Eurite dyke ..	Red loam ..	3	Stony	Acid .	25 Low.	10 Excellent	1·71	12·07	·213	·355	·055	·192	1st.

Potatoes seem to do well on the brown-soiled rises, and oats, lucerne, and wheat for hay are successfully grown on the flats and on some of the slopes. The soil of the rising land is generally well adapted for apples, pears, and stone fruits, and much fruit is grown in the district.

The essential needs of the Tenterfield soils are phosphoric acid and humus. The best form in which to supply phosphoric acid is probably as superphosphate. Humus, where stable manure is not available, can be supplied by growing a catchcrop of cowpea or some other leguminous plant and ploughing it under.

ARMIDALE DISTRICT SOILS.

The soils of the Armidale district may be grouped as follows:—Granite soils, alluvial soils, soils derived from various metamorphic rocks, basalt soils, and Tertiary sandstone, shale and ironstone soils.

A. Granite Soils.

Excepting for small areas derived from coarse granite varieties, which give very coarse, sandy and poor soils, the majority of the granite soils are in fair to good mechanical condition and of fair chemical composition. The capillary power is usually very good, but the water capacity is generally low. They are acid in reaction, and range in mechanical condition from light to heavy loam (from 20 to 70 per cent. clay). The moisture content, the percentage of organic matter, and the nitrogen are usually rather low; the lime and potash are generally satisfactory in amount; but the phosphoric acid less so.

No. VII, Gera Station, is a soil derived from a typical basic granite, and it displays but little divergence from the normal blue granite soils of Tenterfield. No. VIII, from Castledoyle, is a more clayey alluvial, mainly of granitic origin.

No. XIII is a very leached, coarse-grained, sandy soil, from Tilbuster, on the Guyra-road, 7 miles from Armidale. It is a sandy loam, the mineral plant-food of which is largely leached away, and its organic matter is very low in amount. The mechanical condition of this soil is bad for cultivation, since the sand grains are too coarse and the texture consequently too pervious. No. XV is a drift derived mainly from granite, at the junction of Tilbuster and Puddledock Creeks. It is of excellent quality. No. III is an alluvial, mainly of granite origin.

The native timbers of the granite country vary a good deal according to differences in soil. Where white and grey gum alone, or accompanied by a few stringybarks, are the forest trees, the soil is poor in quality. These are the timbers on soil type No. XIII. On the Gera granite (No. VII) we have box, gum, apple, and stringybark. On the Tilbuster granite drift (No. XV), peppermint is the most abundant timber. Although peppermint is mainly confined to poor land, it can only exist where the soil is loose, deep, and well

TABLE III.—Typical Alluvial Soils of the Armidale District.

No.	Locality.	Formation.	Nature.	Depth.	Subsoil.	Reaction.	Water Capacity.	Capillary Power.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Class.
				feet.			per cent.	inches.	per ct.	per ct.	per ct.	per ct	per ct.	per ct	
IV	Heffernan's Claim, Commissioners' Waters; 6 miles from Armidale.	Old leached auriferous drift.	Light brownish loam.	3	Gravel	Faintly acid.	29 Low.	10 Excellent.	·31	2·57	·057	·693	·109	·040	2nd
X	Guyra-road, 13¾ miles from Armidale.	Small flats of detritus from slate & basalt rock on Tilbuster Creek.	Red, heavy loam.	3-4	Clay	Faintly acid.	40 Fair.	10 Excellent.	3·61	10·36	·168	·363	·147	·152	1st
XII	Guyra-road, 8¾ miles from Armidale.	Open flats of Tilbuster Creek; detritus derived from granite, slate, and basalt.	Black loam	3-4	Gravel	Faintly acid.	49 Good.	10 Excellent	2·15	9·03	·210	·600	·311	·145	1st
XVI	Puddledock Creek road, 7½ miles from Armidale	Flat in granite country; detritus from many formations.	Black, heavy, stiff clay.	Many feet.	Clay	Neutral ..	37 Fair	3 Poor	4·42	8·21	·084	·454	·435	·077	2nd (unworkable)
XVII	Puddledock Creek road, 6¼ miles from Armidale.	Flat on Puddledock Creek; detritus from many formations.	Black, heavy loam.	Many feet.	Sandy	Very faintly acid.	42 Fair.	4 Fair.	4·20	11·30	·245	·540	·298	·141	1st
				inches.											
II	Gera-road, 3 miles from Armidale.	Flat in slate country; detritus derived from slate.	Light grey, pebbly, light loam.	6	Friable clay ..	Stongly acid.	21 Low.	10 Excellent.	·72	5·54	·042	·265	[illegible]	·077	2nd

drained; and on such soil, whether good or bad, it thrives unless expelled by a more vigorous tree. On the granite alluvial (No. III) box, gum, and yellow jacket are the most plentiful timbers.

As far as the Armidale district is concerned, it may be stated as a matter of common observation that box, apple, and peppermint characterise the granitic land which is best suited for cultivation, whereas white gum and stringybark country is to be shunned.

The alluvial granite soils in the above table are of fine quality, and should be well adapted for all crops, including lucerne, without any special manure being needed. The red eurite soil occurs only in small patches, and is too shallow to be of use; but the wash from the eurite often extends many chains from the outcrop, which generally caps a hill. This wash gives a good red soil, admirably adapted for farm crops and fruit-growing. The Castledoyle soil type is rather stiff to work, but is very good nevertheless for mixed farming. The Gera soil forms excellent grazing land, and the flats are good for ordinary farm crops. The soil of the coarse granites is too poor and pervious to be of use except for rough grazing purposes.

B. Alluvial Soils.

The alluvial soils are of varying quality and derivation, but all except an old leached alluvial of an auriferous drift (No. IV), are of good quality. Two alluvial soils of granitic origin have already been cited with the granite soils (Nos. XV and III, Table II). The mechanical condition of these granite alluvials is excellent, but their chemical richness is inferior to that of the other alluvials given in this table, except No. IV.

No. IV can hardly be regarded as a genuine alluvial soil. It is an old river wash of a very sandy nature, situated on the flank of a hill above the present flood-level of an adjoining creek. It is therefore very leached. No. X is a red creek alluvial, consisting of sediment from the Black Mountain basalt and slate country. It represents a soil type which only occurs in small flats along Tilbuster Creek. The vegetation on it is of the open forest type, consisting of large gums.

No. XII is a black alluvial loam of mixed derivation, and forming large fertile flats on Tilbuster Creek. It grows excellent lucerne as well as other farm crops, and being of a loose friable nature, it is easily cultivated. No. XVII is a similar, but more clayey soil on Puddledock Creek. Box, peppermint, and gum are the chief timbers on the soil. The subsoil being sandy, the drainage is excellent.

No. XVI is a black clay alluvial at the junction of a small branch gully with Puddledock Creek. It overlies granite country with pegmatite dykes, but the soil itself is a true alluvium like No. XVII, to which granite, slate, and basalt formations all have contributed. The peculiarity of this soil is that it is neutral in reaction, high in potash content, low in nitrogen, and lower in volatile than No. XVII. It would appear to be affected by alkaline

TABLE IV.—Some typical Slate and Sandstone Soils, Armidale District.

No.	Locality.	Formation	Nature.	Depth.	Subsoil.	Reaction.	Water Capacity.	Capillary Power.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Class.
XI	Guyra-road, 12 miles from Armidale	Slate (light) ..	Grey loam ..	inches. 12	Sandy clay	Strongly acid.	per cent. 35 Fair.	inches. 10 Excellent.	per ct. ·96	per ct. 3·56	per ct. ·084	per ct. ·132	per ct. ·127	per ct. ·091	3rd
XIV	Guyra-road, 8 to 8½ miles from Armidale.	Dark slate and chert.	Brown loam ..	Several feet.	Stony .	Faintly acid ..	44 Fair.	10 Excellent.	1·11	4·99	·126	·280	·394	·064	1st
XXIV	Bundarra-road, 3½ to 4½ miles from Armidale.	Conglomerate and ironstone.	Heavy red loam	inches. 12 to 18	Stony .	Faintly acid .	44 Fair.	10 Excellent	3·37	11·98	·238	·361	·061	215	1st
XXIII	Bundarra-road, 3 miles from Armidale.	Sandstone and conglomerate.	Light grey loam	12 to 18	Clay ..	Faintly acid ..	37 Fair.	10 Excellent	1·17	4·07	·070	·160	·031	·033	3rd
V	Gera-road, 8¼ miles from Armidale.	Indurated tuff (metamorphosed	Dark heavy loam.	2 to 3 feet.	Clay ..	Neutral ..	36 Fair.	10 Excellent.	·88	5·18	·082	·312	·092	·035	2nd

water. This, too, would account for the stiffness of the soil. A good dressing of superphosphate will probably have the effect of bringing this otherwise excellent soil into good condition.

No. II, from the Hillgrove or Gera-road, is a soil formed partly from wash off slate country, and partly from the decomposition of slate *in situ*. It is a poor soil with a high percentage of ironstone pebbles of concretionary origin. It is poor country for grazing as well as for cultivation purposes, though oats, barley, and wheat for hay should be able to grow on it with proper attention and manuring. This soil has a clayey subsoil of great depth, and of very friable nature, and containing layers of concretionary ironstone pebbles. The sub-drainage is very good, for which reason the soil should be cultivable in spite of its relative poverty. A large number of flat, plain-like areas, with a straggling, open forest, situated on the slate country between Armidale and Gera, or Hillgrove, have soil essentially of this type.

It is evident from the foregoing tables that the granite alluvials are not so rich chemically as those of very mixed origin or of basaltic origin, though richer than some slate alluvials. Thus Nos. XV and III (Table II) are chemically not as rich as Nos. X, XII, XVI, XVII (Table III), but in mechanical condition they are much superior to Nos. X and XVII, and equalled only by Nos. XII and XVI, because both these soils are themselves partly derived from granite. As already stated, No. IV can hardly be regarded as a true alluvial, and No. II is only partly alluvial. The latter is derived from light-coloured slates, similar to those yielding soil No. XI (Table IV).

C. Slate and Sandstone Soils.

In the next table are given the analyses of some slate, sandstone, and ironstone soils of the Armidale district. Soil No. XI is typical of undulating country on light-coloured slate formation, and is the hill-slope type of soil corresponding to No. II. It was taken 12 miles from Armidale, along the Guyra-road, and it is evident, both from the heavy timber on this slate country and from the analyses, that the slates in this end of the district are richer in potash minerals than in the other locality (No. II). The chief timbers are gum and stringybark. The soil is shallow, only 8 inches, and the subsoil stony. When cleared it is tolerably good grazing country, but of no immediate use for farming.

No. XIV is derived from a formation of black cherts and chloritic slates, outcropping on the Guyra-road, 8 to 8½ miles from Armidale. It is heavily timbered with gum, box, stringybark, ironbark, yellow jacket, &c. The hills in this locality are a little steeper than usual in the slate country of the district, yet the soil on them is a deep shingly loam, of a rich coffee colour in some places, and light brown in other places. This formation is not one of the common slates of the district. It yields much superior soils, covered with a thick growth of sweet grasses where the timber is cleared off. It would make excellent orchard and vineyard country, but is rather too steep for general farming purposes.

TABLE V.—Some Typical Basalt Soils, Armidale District.

No.	Locality.	Topography.	Nature.	Depth.	Subsoil.	Reaction.	Water Capacity.	Capillary Power.	Moisture.	Volatile.	Nitrogen.	Lime.	Potash.	Phosphoric Acid.	Class
				feet			per cent.	inches.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	
IX	Guyra-road, 15-mile peg from Armidale.	Top of Black Mountain Range.	Heavy chocolate loam.	2 to 3	Clay and stone	Faintly acid.	40 Fair.	10 Excellent.	3·97	9·85	·112	·451	·058	·220	1st
XVII *bis*	Guyra-road, 2½ miles from Armidale.	Near hill top ..	Heavy red-brown loam.	2 to 3	Clay and stone	Acid.	57 Good.	3 Poor.	3·21	12·16	·084	·376	·145	·187	1st
XVIII	Kelly's Plains	Flat country ..	Black clay soil	Many feet.	Black clay ..	Very faintly acid.	54 Good.	7 Good.	7·25	12·60	·182	·360	·066	·123	1st
XIX	Kelly's Plains . ..	Slight slope ..	Black clay soil	Many feet.	Black clay ..	Very faintly acid.	52 Good.	6½ Good.	8·50	14·30	·210	·940	·184	·301	1st
XX	Bald Knob (Kelly's Plains).	Flat near base of hill.	Black clay soil	Many feet.	Black clay ..	Neutral.	69 High.	2½ Poor.	10·74	16·60	·238	1·186	·282	·260	1st
XXI	Bald Knob	Hill-slope	Chocolate clay soil.	2 to 3	Clay and stone	Faintly acid.	54 Good.	10 Excellent.	7·49	15·46	·196	·659	·178	·284	1st
XXII	Bundarra-road, 5 miles from Armidale.	Flat, ill-drained country.	Red to light-brown.	2 to 3	Stone	Faintly acid.	50 Good.	7 Good.	4·45	9·20	·091	·186	·075	·074	2nd

No. XXIV, taken about 4 miles from Armidale, is typical of a stretch of ironstone-conglomerate country of Tertiary age, extending approximately from the 3½ to the 4½ mile pegs on the Bundarra-road. The soils are generally red or chocolate. They are typically sweet and fertile soils, excellently adapted for grazing, orchard purposes, and general farming. The forest consists mainly of box and apple.

No. XXIII, taken 3 miles from Armidale, on the Bundarra-road, is typical of areas of white sandstone and conglomerate of Tertiary age. It is a poor and sour soil, on which no crops are likely to do any good. The clayey subsoil is generally close to the surface. Straggling gum trees and a few oaks are practically in possession of the forest.

No. V is a soil derived from a metamorphic tuff interbedded in the Palæozoic strata, about 8½ miles from Armidale, on the Gera-road. Small patches and elongated bars of deep black soil of this derivation are not uncommon in the otherwise poor slate areas east of Armidale. This is a much richer soil, especially in lime content, than that formed from the normal slates.

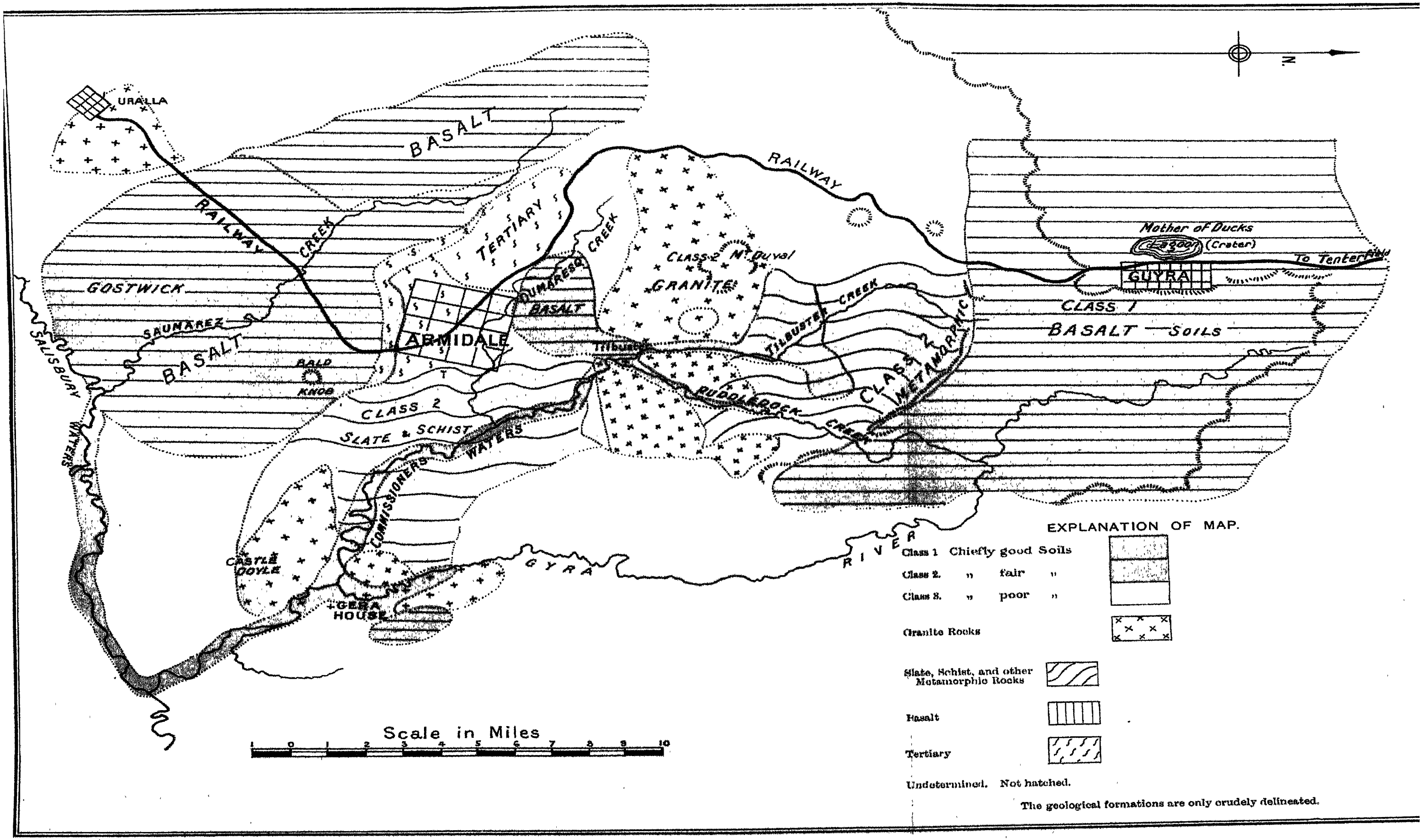
D. Basalt Soils.

The basaltic soils compiled in Table V are, as far as chemical composition is concerned, the best of all the New England soils; still for farming purposes one would prefer the deep alluvials of mixed granite and basalt origin, Nos. XII and XVII. The soils of pure basalt derivation are usually very heavy to work, and inclined to clog, and become very impervious in wet weather. They therefore require more attention and more labour to be bestowed upon them to keep them in order than the alluvials, but in good seasons they are in turn more productive. Their great value has only recently dawned upon the people of the Armidale district. The figures in the table speak for themselves. The reserve of mineral plant-food in these soils is very great, and clearly all that is needed by such soils as those of Kelly's Plains to keep them in condition is that they should be thoroughly and frequently worked.

The Black Mountain soil, No. IX, is rather low in potash, which is rather remarkable, as it is a noted potato soil. However, the amount of immediately available and water-soluble potash is probably relatively high, and rock disintegration and decomposition being fairly rapid, the supply is maintained.

Soil No. XXII, taken 5 miles from Armidale on the Bundarra-road, is typical of an area of very fine-grained compact andesites and basalts, which, because of their closeness of texture, decompose with slowness and yield shallow, stony soils. The country covered with this formation being a flat-topped tableland, local depressions with imperfect drainage abound, and in these the soil is very sour. Oats, the most successful crop on this soil type, is infested with sorrel in many places. This pest is also a serious trouble on many light sandstone, granite, and slate soils of the district, and is invariably an indication of sourness. Probably letting the land lie fallow and giving it

Map giving an Outline of the Rock Formations and Soils of the Armidale District.



a good dressing of lime before replanting and sowing, will destroy the organic poison which retards the growth of the cultivated plants and allows the sorrel to get the upper hand.

In connection with soils Nos. XXII and XXIV, both red chocolate soils, it is interesting to note the difference in the percentage of phosphoric acid. No. XXIV is well drained. Although iron is rapidly liberated from the subjacent ironstone, the excess is readily leached away by the good drainage existing on the flank of the tableland. No. XXII is so badly drained that ironstone concretions form in this soil. The acid-soluble phosphoric acid is low in this soil, while in the well-drained ironstone soil it was good. It would appear from this that on ferruginous formations, where drainage is so bad as to cause the precipitation of nodular iron ore in the soil and subsoil, phosphoric acid is thrown down also, and no addition of phosphatic manure to such a soil is likely to be of any benefit without draining. From the nature of the andesitic rock underlying soil No. XXII, there is no doubt that it is an apatite-bearing rock, which, under different conditions, would give a soil plentifully supplied with soluble phosphate. This land will also benefit by liming as above stated.

General Remarks.

As compared with coastal soils there are several points of interest in the New England soils. Soil acidity is less on the tableland than on the coast, clearly a result of climatic differences. Nitrogen is also somewhat lower in amount, and this is also the case with volatile organic matter. From experiments tried it appears that the nitrogen is contained mainly in the humus, a fact which has also been established in other countries for arid and semi-arid soils. The nitrogen is therefore in a readily available form. Since in a climate like that of the New England, in which the rainfall is unevenly distributed through the year, the incorporation of organic matter in the soil by natural agencies is a comparatively slow process, it is important that farmers should each year incorporate a certain amount of organic matter in the soil, by ploughing in stubble, green manure or stable manure, so that the soil may not be depleted of organic matter. Each soil type of the New England is richer in mineral plant-food than its geological equivalent in the coastal districts.

The humus percentage was estimated in several of the typical New England soils. The results are stated in the following table:—

No.	Formation.	Humus (Organic matter in).	Volatile.	Nitrogen.	Ratio of Humus to Volatile (approximate).	Ratio of Nitrogen to Humus (approximate).
		per cent.	per cent.	per cent.		
VII	Granite	·988	4·62	·070	1 : 5	1 : 14
IX	Basalt	2·252	9·85	·112	2 : 9	1 : 20
XI	Slate	·790	3·56	·084	1 : 4	1 : 9
XII	Alluvial	2·581	9·03	·210	1 : 4	1 : 12
XX	Basalt flats (black) ...	2·737	16·60	·238	1 : 6	1 : 12
XXI	Basalt slope (red) ...	2·328	15·46	·196	2 : 13	1 : 12

This table shows that the humus in general constitutes from one-fourth to one-sixth of the total volatile matter, and that assuming all the nitrogen of the soil to be contained in the humus, the percentage of nitrogen in humus varies from 5 to 10 per cent., and the higher figure is more frequently approached. It follows from these figures that humification and nitrification are favoured by the New England climate when the supply of organic matter in the soil is kept up, though as already stated, on the poorer soils the humus forms only a fraction of a per cent. of the total weight of soil, the soil being in such cases very deficient in volatile organic matter. In the cultivation of the poorer soils of the New England area it is therefore of importance that organic matter should be incorporated in the soil, in the form of stable manure, compost, bush scrapings, or ploughed-in green crop.

Manuring.

Very few of the Armidale soils at present under cultivation are in any great need of manure, at any rate not chemical manure. Not enough attention is paid to keeping up the supply of humus.

Those granite soils which are suitable for cultivation purposes and for orchards are not very rich, and would no doubt benefit from a general manure; but the upkeep of the humus percentage is of greater importance than chemical manure. This applies likewise to slate and sandstone soils, but on the light-coloured slate areas, the addition of a general manure is strongly recommended.

Very stiff black soils of neutral reaction will probably benefit most from a small dressing of superphosphate.

Crossing Varieties of Corn.

Mr. C. K. Cadell, of "Coolamon," Deepwater, has forwarded to the Minister of Agriculture some sample cobs of corn showing black, yellow, and white grains on the one cob. He had obtained seed of black and yellow varieties, and sowed the black grains, but there were white and yellow varieties growing alongside.

Probably no specimens yet sent to the Department showed crossing so clearly as these. The crossing is brought about by several agencies, the principal of which are bees and wind.

The moral is that different varieties of corn should not be grown for grain n the same district; at any rate if the time of flowering is about the same. Different wheats may be grown alongside each other, often to great advantage in uncertain seasons, but not corn. Each district should decide upon or evolve the most suitable variety (or early and late varieties, one each), and rely upon careful selection of seed for improved yields.

White Butterflies attacking Cabbages and Cauliflowers.

In the *Tamworth Daily Observer* of 3rd June, an article entitled "Mixed Farming at Scone," describes how Mr. S. H. Thomas, a share farmer between Kingdom Ponds and Middle Creek, lost 2 acres of cabbages and cauliflowers, as well as seed beds, of a total value of £220, through the ravages of white butterflies and their larvæ. The butterflies came in millions towards the end of February or beginning of March, and laid their eggs upon the newly-formed hearts of the vegetables. The resulting grubs riddled hearts and leaves with holes, and rendered the whole crop unmarketable.

Now, why could not Mr. Thomas have notified the Department of Agriculture when these butterflies first appeared in such numbers? At that time it would have cost 2d., and the result would have been a visit from the Government Entomologist or one of his staff to carry out methods of checking the pest. Mr. Froggatt assures us that he would not have interfered with anything except the butterflies, and that he would have been as safe to have on the property as the journalist who wrote the article for the *Observer*. Perhaps another farmer, reading this, may be induced to take advantage of the Government's assistance in checking pests in their early stages. Now, thanks to recent postal arrangements, it will only cost 1d. to obtain advice or a visit from an expert.

In this particular case Mr. Froggatt only heard of the trouble through a newspaper article, published long after the crop had been destroyed. He has, however, offered the following remarks, which may be of assistance to growers should the butterflies again become aggressive:—

This is the first record which we have of the white butterflies ever attacking cabbages, as our species lives upon the foliage of the different species of *Capperis*. But the closely allied white butterflies of Europe and America, whose larvæ are known as "cabbage worms," are very serious pests in those places, and do an immense amount of damage in some seasons.

The large white (*Pieris brassicæ*) and the small white (*Pieris rapæ*), are the two cabbage butterflies of America, and are kept in check by spraying with Paris green, mixed in the proportion of 1 lb. Paris green to 150 gallons of water. There is no danger in using this, as the amount applied to each cabbage is so minute that a man would have to eat a dozen heads of cabbage at one meal before he could poison himself. Moreover, before the cabbage head is sold or cooked, all the outer leaves are removed, and it is these outer leaves upon which the caterpillars have been feeding, which have received the spray to kill them. Chemical analysis has shown that on a head of cabbage, from which the outer leaves have been removed when preparing for cooking, within a week after heavy spraying with Paris green, not a trace of arsenic remained.

The caterpillars succumb to the poison very readily. The sooner the spraying is done after the eggs are laid, the easier it is to kill the little grubs before they have done any damage to the foliage.

It is quite probable that the tobacco dust and dry lime treatment, used so successfully against the tiny diamond-backed cabbage moth, would check and destroy the cabbage butterfly grubs, particularly if used as soon as they appear.

The Entomologist is anxious to obtain specimens in all stages of growth of any butterfly or moth attacking field crops like cabbages.

Potatoes.

A. J. PINN, Assistant Inspector of Agriculture.

The Blight and its Lessons.

DURING the past season, the blight (*Phytopthora infestans*) has made its appearance over the whole of the potato-growing districts of the State. Because the attack was not associated with all the characteristics usually accompanying it in other countries, many growers discredit the fact that the disease is Irish Blight. It is quite natural that the peculiarities of the disease would not altogether tally with those of other lands, because our weather conditions vary so greatly.

It is probable that in future years, with a recurrence of drier seasons, the outbreaks of the disease will not be nearly so virulent. Even this year, after the tops had been affected, it was often difficult to distinguish the diseased portions during dry, sunny spells.

The contention that the disease is not Irish Blight, but merely wet rot, is totally upset by the results of scientific examinations with the aid of the microscope. All fungi have one or more characteristics by which they can be identified, and in the case of *Phytopthora infestans* the chief feature is the lemon shape of the spore (seed of the fungus). This shape is not peculiar to any other potato disease. For full description of the fungus, see Farmers' Bulletin, No. 31.

Owing to the great loss in some districts, many growers are dubious about planting next year. It is with the idea of relieving this feeling that the following notes are written.

In other countries, after blight has first made its appearance, its occurrence has been perennial, and nowhere has it been exterminated, although under improved methods the damage has been reduced to a minimum. The appearance of the disease is even beneficial, in that it will tend to a greater and more careful study of potato culture, and will result in improved methods of cultivation. Large areas will in future be reduced to smaller ones; and instead of slipshod farming being carried on, these small areas will be treated in such a manner as to produce nearly as much as, if not more than, was yielded by the larger acreage. During the past few years, owing to good seasons and remunerative prices, excellent results have been obtained from potato-growing with but little attention; and it would appear that as a consequence the aim of many growers has developed into planting as large an area as possible, without paying attention to the methods adopted in putting in the crop, or in its subsequent cultivation.

Whilst travelling through the country, I noticed that many of these large areas have been attained by planting under the sod, and after harrowing, the

crop has been left to chance. In many cases, in order to plant these large areas, "pig potatoes" were used for seed; in fact anything was used that would produce a potato plant. I know of some instances where only 1s. 6d. per bag was paid for such seed. Is it any wonder that these crops failed to produce more than a couple of tons per acre, whereas yields of 8 tons or more were obtained where proper cultivation was given, and attention paid to the quality of the seed?

The great question is, what are potato-growers to do in the future to reduce the risk of loss and to obtain maximum yields? The following are the chief items for consideration which will govern successful potato-growing in the future:—

1. Season of growth.
2. Selection of seed.
3. Selection of varieties to be grown.
4. Proper cultivation.
5. Spraying.
6. Time to dig.
7. Methods of storing.

These will be treated in the order named.

1. Season of Growth.

The State is divided into two sections as far as the growth of potatoes is concerned, viz., coastal and tableland.

In the warm coastal districts two crops of potatoes are grown each season. The first is planted in July or August, and is called the Spring crop; the second in February, designated the Autumn crop.

The weather conditions generally prevailing throughout the growth of the spring crop are such as to be unfavourable to the development of the disease, and consequently very rarely is any damage caused. The autumn crop meets with conditions favourable to the rapid spread of the fungus, with the result that the yield of clean potatoes is very small. In addition, the tubers are marketed at a time when potatoes from the tableland districts are available, with the result that the prices are low. The question arises whether it is advisable for the growers of the North Coast to continue with the growing of the autumn crop. In my opinion they should confine their attention during this period to the preparation of the soil for the spring crop, by green manuring and cultivation. The spring crop usually meets with a big demand, owing to the market being bare, and consequently realises high prices.

On the tablelands there is practically only the main crop grown, but even here it may be advisable to plant early in order to get the crop fairly well advanced before the disease makes its appearance.

2. Seed.

During past years seed potatoes have been picked in a haphazard manner, and have generally consisted of the grade between the "pig" and marketable

sizes; in fact, anything that was left at the end of the season after all marketable tubers had been sold. With all other varieties of crops the seed is carefully selected from the best available, and it is apparent that some change should be made in the selection of seed potatoes. If growers object to planting large potatoes, a system such as the following could be adopted:—

Each grower should select, when digging, the very best roots, and reserve them for a special plot the following year. This plot would yield a considerable quantity of potatoes, all of which could be used as seed the next season. By this method a system of continual selection would be carried out and the progeny from run-out plants eliminated. Roots which offered resistance to blight could also be selected, which would materially assist in the production of a disease-resisting strain.

In the variety trials of potatoes carried out on the Farmers' Experiment Plots for the season 1909–10, two varieties stood out far above the others. Mr. Valder, in his report, states as follows:—

> At first sight it seems rather strange that first and second place should be filled by the two varieties obtained from one place, viz., Irvine Ruby and Coronation from Mount Irvine. This fact is, I believe, due more to the quality of the seed than to the apparent superiority of the varieties. When an inspection was made, before planting, of the whole of the seed of the eight varieties, it was at once apparent that the Irvine Ruby and Coronation potatoes were much better grown samples than any of the others. The growers of these potatoes, Messrs. C. P. Scrivener and H. B. Morley, of Mount Irvine, Blue Mountains, state that they adopt the practice of selecting fairly large and well-grown tubers for seed. These are planted whole, and wider apart than the distance growers usually plant them, viz., in drills 3 feet apart, and 2 feet apart in the drill. They claim that the methods of using large tubers for seed, and, planting them well apart, yield heavy crops of well-grown tubers.

There is considerable diversity of opinion as to which is the best size of tuber to use as seed. Small potatoes can be divided into two classes—(1) the late-formed tubers of a strong, robust plant; (2) the produce of a plant of low vitality. The former would probably yield as well as its parent, but the latter could only be expected to produce a crop of poor quality. When small potatoes, selected from the pit, are used year after year, reduction in yield must follow, since every year the produce of weakly plants would be on the increase.

Another matter in dispute is the advisability of using cut seed or whole potatoes. Experiments carried out by this Department with whole and cut seed did not produce results more favourable to one than to the other. If the season should be dry at planting time, it would be preferable to use whole potatoes, as the cut seed would dry out considerably before shooting, and consequently would not be able to give the young plant the same start in life as a whole tuber. When cutting is resorted to, it is advisable that the planting should be done as soon as possible after cutting.

As the condition of seed has a big influence upon the yield, the following methods of treatment are recommended:—(1) Place the seed tubers in shallow boxes or trays, and store in a well ventilated and lighted room. The trays should be made with the ends higher than the sides; this will admit light and allow of a proper ventilation. By this method it will be found that the buds are short, dense, full of colour, and sturdy enough to resist fairly rough

handling. Potatoes stored in this manner are not so liable to rot, and any diseased tubers can readily be removed, together with any that have produced weak shoots. The chief advantages of this system are that the sets produce fine, healthy plants, and are in readiness for an early planting. As early crops are more likely to escape blight, this is in itself a big advantage in its favour. (2) A modification of the above method, which would involve less labour, would be to spread the seed as shallow as possible on the floor of a shed; or (3) store in a rick made of saplings, the floor of which should be about 6 or 12 inches above the ground level. The spaces between the saplings would allow plenty of ventilation.

If the seed of the early crop is being stored, the storage chamber should be made moth-proof, for the early part of the season, by using hessian; but this would be unnecessary for those stored during the winter.

Previous to last year's planting many farmers acted upon the advice of the Department and dipped their seed for two hours in a solution of formalin, of a strength of half a pint of formalin to 15 gallons of water. This measure does not in any way cause the potato to become immune from the attacks of blight, but only destroys any adhering spores. In most cases, however, the resulting crops treated in this manner were very free from *scab*, compared with those untreated.

All seed should be treated as above, but the treatment must be carried out before the potatoes commence to shoot.

3. Varieties.

It is an accepted fact that newly-bred varieties offer a greater resistance to the attacks of blight than old-established ones. This point has been borne out during the past year in this State, as the old-established varieties, like Brownell's Beauty, have been much more affected than some of the newer varieties.

Although breeding of new varieties has been carried out for many years, no variety has yet been bred which is totally immune from attack.

Arguments have been advanced that if the original wild potato were used for crossing with varieties now grown, blight-proof varieties would be produced; but the fact is overlooked that the wild variety itself is susceptible to the disease.

The breeding of new varieties should be carried out by adopting careful and scientific methods; although occasionally good sorts are produced as a result of chance crosses. The hybridizer meets with many difficulties in trying to effect desired crosses, such as non-flowering varieties; and even where flowers are formed it does not follow that apples will be produced. If growers observe the proportion of apples to the number of flowers formed, it will give them some idea of the trouble likely to be experienced in the work of breeding. There are two methods employed to force potatoes to form apples, viz. (1) taking the tubers away from the plant as they form; (2) washing away the surface soil and only allowing the lower roots to nourish the plant.

Although recognising the need of new varieties with increased vigour, it is probable that a lot could be done in the improvement of the best of our present-day strains. The method of selection and the treatment of the seed have in the past been against the improvement of varieties, but if the care given to new varieties was bestowed on these older strains it is certain that they would improve in vitality, and consequently remain in favour for a much longer period than is at present the case.

Sometimes the care bestowed on new varieties is abused by resorting to forcing in order to obtain large quantities of seed to place on the market. This early forcing soon expends the increased vitality obtained by crossing, and the variety is practically reduced to the same level as the older sorts.

During the past season the following varieties proved to be the most blight-resistant:—

Queen of the Valley.—This is a late maturing red-skin variety, and a heavy yielder, producing a good average sample. It has stood out as the best blight-resister in trials extending over the whole of the potato-growing districts of the State.

Satisfaction.—This is a light red-skin variety, of excellent shape, large, clean, and with few eyes. It is now comparatively well known, and growers should plant largely of this variety next season.

Coronation.—A late maturing blue-skin variety, somewhat resembling Early Manhattan, but considerably later, and a heavier cropper. It generally yields very even, clean tubers of a good marketable size.

Magnum Bonum.—A late maturing white-skin variety, which has been largely grown in the Crookwell district. The tubers are rather coarse, and, owing to its spreading nature, care is required when digging.

4. Cultivation.

In order to minimise the loss caused by disease, any method which will help in this direction should be adopted. The cause of tubers being attacked by blight is chiefly that the spores are washed from the leaves through the soil on to the potatoes. If the disease was conveyed to the tuber only per medium of the stalk it would be found that the disease appeared at the heel end of the tuber only, whereas its presence is not confined to any particular portion. Again, if spread in the manner referred to, it would travel from the centre to the outside, whereas one characteristic of an attacked potato is that the disease always works from the skin inwards. From the above facts one is led to believe that the bulk of the disease is caused by the washing of the spores through the soil. If hilling were carried out there would be a greater thickness of earth for the spores to pass through, resulting in the arrest of many of them, with a corresponding decrease in the amount of disease. The hilling would also save a large quantity of tubers from the attack of the Potato Moth (*Lita solanella*). In seasons when this pest is prevalent, all potatoes which appear at the surface are affected by the grubs (which are the larvæ of the potato moth), whereas if hilling were carried out all potatoes would be screened from attack.

The hilling should be worked in connection with intertillage of the crop, and should be done fairly early in the growth of the crop, as late hilling interferes with the root system, and causes a decrease in yield.

Intertillage is also necessary in order to keep down weeds, which not only take the moisture from the soil, but also prevent effective spraying.

5. Spraying.

Spraying has been adopted and proved satisfactory by the most up-to-date growers in other countries, and, as a result of trials carried out by this Department, I do not hesitate to recommend the adoption of this measure by farmers in this State. During the past season, spraying experiments were carried out on several farmers' holdings in the Hunter River district, in the vicinity of Bolwarra. The results, which will be published separately, demonstrate the success of the tests.

It is not claimed that spraying will absolutely prevent disease being found in the tubers, but it will materially hold it in check, and in most cases, by keeping the tops vigorous for a longer period than would have been the case if untreated, will result in an increased yield.

It is probable that in some seasons the blight will cause little or no damage, but spraying will have to be carried out each year, as it is impossible to forecast the weather conditions.

It will prove a payable practice over a number of average years. In the seasons when the disease is not virulent, the cost of the spray will be small, as fewer applications will be required. Full directions for the preparation of Bordeaux mixture have been published from time to time in the *Agricultural Gazette*, and also in Farmers' Bulletin No. 31.

Our experience with spraying machines has been limited to the Fleming horse-power make, which has answered the purpose in a satisfactory manner. This machine costs about £30 f.o.b. Melbourne, and has a capacity of spraying 15 acres per day when the water supply is good.

For very small growers a Knapsack pump, costing about £3 or £4, will be all that is necessary. As the area under crop increases it will be found advisable to purchase larger machines, such as the Strawson, which would cost about £17 10s. f.o.b. Melbourne. This is only a hand-power machine, and the larger growers will find it more profitable to purchase a horse-power sprayer, such as that mentioned above.

The following hints as to the selection of machines, &c., and the care of same, may prove serviceable. They are extracted from an article on "Spraying," by Messrs. Allen and Bryant, which appeared in the *Gazette* for March, 1910:—

SPRAY PUMPS AND OUTFITS.

The particular outfit to be selected for spraying purposes will depend altogether upon the amount and character of the work to be done. Numerous pumps are made for the special work of spraying. A pump simple in construction is to be preferred. No one outfit can be expected to suit all the varying conditions of spraying. Hand-pumps should give great pressure with the least expenditure of power. All working parts should be made of brass, and easily taken to pieces. No type of spraying outfit is more widely used, or has given better satisfaction, than the barrel-pump. There are a great

many different makes on the market, of which many are efficient and successful. They are mounted in a great many ways. An ordinary fifty-gallon whisky barrel forms an excellent and inexpensive tank for holding the spray. The pump, according to its design, may be inserted in the end or the side of the barrel. The barrel may be mounted, to suit the operator, on a slide, or on two wheels, or it may be placed in a cart.

Hose and Nozzle.

Nothing contributes more to success in spraying operations than good hose and nozzles. Inch hose is generally used. It never pays to use cheap hose in spraying, as it is subjected to a great deal of rough handling. It should be three or four-ply.

The couplings should be of a style readily adjusted, and everything must be kept tight to withstand pressure.

Nozzles.

One of the most important parts of the whole apparatus is the nozzle. Good results in the application of the spray mainly depend upon its efficiency. For general use the best nozzle is the Vermorel, or one of that type. The four most commonly used nozzles are as follow :—

The Vermorel.—This undoubtedly throws the finest spray of any. In use it should be held quite near the foliage, as the liquid is not thrown out with much force.

The Bordeaux.—This is a splendid type. It has the advantage over all other spray nozzles in that the character of the spray is readily changed from a solid stream to a mist-like, fan-shaped spray. If there is any clogging, it is easily remedied by turning the handle, thereby forcing out the obstruction with the pressure of the pump.

The Cyclone.—The spray from this nozzle is conical shaped, similar to the Vermorel.

The Friend.—This nozzle is coming largely into favour.

The Agitator.

All pumps should be fitted with good agitators. The proper agitation or intermingling of the spray liquid is one of the chief features in spraying, and unless it is thoroughly done, good results will not be obtained.

Care of the Outfit.

A spray-pump, like any other machine, will do good work, and last in proportion to its care. When a pump does not work properly, the cause of the trouble should be ascertained at once, and remedied, otherwise permanent damage may result. When a spray-pump is first received, its working parts should be carefully studied. After the pump has been used, it should be thoroughly washed out with warm water, as most of the spraying mixtures are highly corrosive in their action. The hose should also be thoroughly washed out. Always keep the barrel filled with water when not in use, to prevent the wood from warping and hoops becoming loosened. With proper care the pump should last several years ; the hose, however, will probably have to be replaced after one or two seasons.

6. When to Dig.

In Bulletin No. 265 of the New York Agricultural Experiment Station, results were published of the investigations dealing with the question when potatoes should be dug after the tops have been affected with blight, in order to avoid, as far as possible, loss of tubers from infection. The conclusion arrived at was that digging should be delayed for at least ten days after the tops die, and that a longer delay does no harm. As long as the tops remain even partially green, the spores of the blight fungus continue to live. In the process of digging, the tubers may become covered with these live spores, and if conditions are at all favourable, more or less loss will follow.

In this connection attention should be called to the objectionable practice of covering the tops of the open bags with potato haulms to protect them from the sun and frost. If the haulms have been affected with blight they may infect the tubers. The danger is especially great if the tops are green, or if rain comes while the tubers are thus covered.

7. Storing.

The question of the treatment of seed tubers after digging has already been discussed. With those intended for culinary purposes it must be remembered that light causes a yellowing of the flesh and produces bad boiling qualities ; consequently, when any method of storing is adopted, it is necessary that the light should be excluded.

In order to prevent the spread of rot, the potatoes should be perfectly dry, no matter which method of storage is adopted. Pitting is not recommended where it can possibly be avoided.

It is preferable that the storing be carried out in sheds which are well ventilated, the potatoes being covered with straw or hessian to exclude light.

Where large areas are grown and pitting must be resorted to, a system of ventilation should be provided by leaving openings and filling them with straw, covering in such a manner as to keep out the rain, and at the same time allow of a free passage of air.

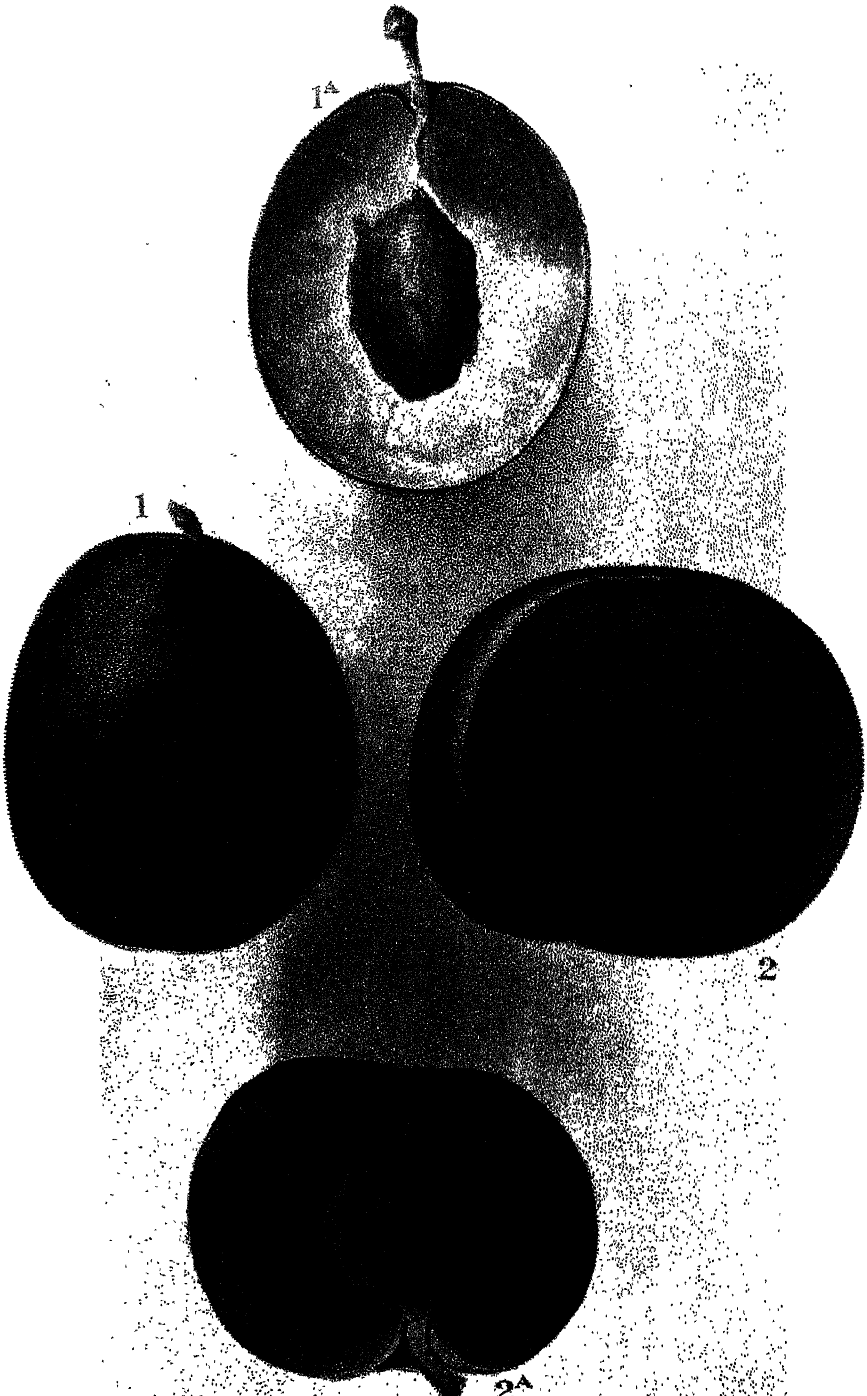
When dug, the potatoes should be left exposed to the sun for a time before bagging. This will allow them to dry thoroughly, and there will be less adhering earth.

Farming at Hartley Vale.

Mr. Thomas Waldron carried on dairy-farming successfully at Hartley Vale for seventeen years, and is kind enough to say that he owes his success to the instruction received from the *Agricultural Gazette.* He took up farming at first as a hobby. His practice was not to fallow, but to grow oats continuously for hay, after ploughing subsoiled land 10 or 12 inches deep. He harrowed the oats several times whilst growing. After the hay was off he would sow rape or red clover as a catch crop, feed it off to the cattle, and plough again. He got good crops of hay from 10 acres for fifteen years in succession, including the big drought. Several years he got 4 tons of hay per acre, the oats growing 5 feet 6 inches and upwards in height. He would sow 3 bushels of oats per acre, with 1 cwt. superphosphate per acre in two sowings. Sulphate of ammonia proved unsatisfactory unless the rainfall was very good, as it usually burnt the lower leaves and caused them to turn brown.

Mr. Waldron claims to have made the first silage west of Sydney, in a pit situated on a sandy hill. The fodders used were maize, barley, oats, ambercane sorghum, and lucerne. The pit held about 25 to 30 tons, and the venture was a great success. The silage had a pleasant smell, and the cattle ate it ravenously. Sometimes they left the maize stalks, but Mr. Waldron gathered these up and chaffed them, and not a bit was wasted.

Concluding, Mr. Waldron says he had no time for weeds or fallowing. His motto was, "Feed the land and get the utmost off it."



H. S. BURTON LITH.

W. A. GULLICK, GOVERNMENT PRINTER

Grand Duke and Satsuma Plums.

W. J. ALLEN.

The coloured plate herewith shows two plums which are recommended for more extended cultivation in this State. The first one, Grand Duke, is a late variety, suitable for the cooler districts; while Satsuma, a Japanese plum, is more suitable for warmer climates.

1. Grand Duke.

FRUIT.—Large.
Colour.—Dark blue.
Flesh.—Yellow; firm; richly flavoured.
Stone.—Oval.
Quality.—Good.
TREE.—Moderately vigorous; productive; heavy bloom; late.

The stem of the Grand Duke plum is usually about an inch in length. One of the specimens shown is not typical in this respect.

2. Satsuma.

FRUIT.—Large; broad, with short stem.
Colour.—Deep crimson.
Skin.—Thick.
Flesh.—Dark red; firm.
Flavour.—Slightly acid.
Stone.—Oval, of medium size.
Quality.—Good.
TREE.—A spreading grower; self-sterile; sometimes over-bearing, followed by an unproductive year.

Shortening Low Shoots on Peach-trees.

"C.B.P." has some peach-trees with new shoots under the main limbs covered with fruit-buds. There are very few shoots on the main limbs. He is not pruning to obtain large fruit, as he considers medium-sized fruit pays best. He is undecided whether to leave the shoots, thus injuring the symmetry of the tree but perhaps giving him more fruit, which is, of course, the main object.

Mr. W. J. Allen, Fruit Expert, replies:—

I would not recommend leaving the whole of the shoots referred to. It would be better to shorten each back by about one-third. This would leave quite enough fruiting spurs on them provided the top is reasonably well furnished with spurs, and would not interfere much with the symmetry of the tree. I would also feel inclined to shorten the main limbs, so as to force out stronger growth along the main arms and centre of the tree. This may possibly reduce the coming season's crop, but should supply ample fruit-wood for the future.

Fruit-flies and other Insects attacking Cultivated and Wild Fruits in New South Wales.

W. B. GURNEY, Assistant Entomologist.

PART II.

PART I of these notes appeared in the *Agricultural Gazette* for May, 1910, and dealt with the discovery that the Queensland and Island Fruit-flies, so-called, are native flies of the coastal district of New South Wales, and develop in the wild fruits of our scrubs. A new species of parasitic wasp was discovered, figured and recorded for the first time. It develops in and destroys the maggots of the Queensland Fruit-fly in wild fruits, and occasionally in orchard fruits. Specimens were forwarded to Mr. P. Cameron, F.I.S., England, who has described the new species under the name *Opius Tryoni* in a paper read before the last meeting of the N.S.W. Linnean Society. Details of the life-history of the Mediterranean Fruit-fly (*Ceratitis capitata*) were given, and it was pointed out we have never developed this species in wild fruits, it being found to live wholly in orchard fruits, with the exceptional record that it has upon rare occasions developed in fruit of Prickly Pear (*Opuntia*).

The present section deals with the Queensland Fruit-fly, its prevalence, the sequence of orchard and wild fruits attacked, and the extent of parasitism we have discovered.

It is to be noted here that the Queensland Fruit-flies bred in the Gosford-Narara and other coastal districts appear to be a distinct variety of the Queensland species (*Dacus Tryoni*, Froggatt). We have developed some 18,000 specimens, and they are decidedly smaller and darker than the Queensland specimens.

QUEENSLAND FRUIT-FLY.

(*Dacus Tryoni.*)

The New South Wales variety of the above species attacks :—

Orchard fruits:—Oranges, mandarins, comquats, peaches, and nectarines ; occasionally plums, apples, pears, lemons, and loquats.

Wild fruits :—White Ash berries (*Schizomeria ovata*), Cheesewood Berries (*Acronychia lævis*), Black Apple or Native Plum (*Sideroxylon australe*), Wild Black Fig (*Ficus stephanocarpa*), and *rarely* Lillipilly (*Eugenia Smithii*).

The natural home of our variety of the Queensland Fruit-fly is the moist dense scrubs of the eastern coast, from Sydney north to Queensland. I have bred them in wild fruits received from Grafton, Glen Innes, Singleton, Gosford, and Hornsby. While exceedingly plentiful in the scrub, only small numbers as a rule visit the orchards, though occasionally they appear in very serious numbers. Our data shows that they attack available wild fruits before turning their attention to orchards. Mr. J. H. Maiden, Government Botanist, has kindly identified the wild fruits for me.

The wild fruits which they infest are a menace, in that a certain percentage of the flies are likely to avail themselves of the adjacent orchard fruit. Immediately adjacent wild fruits may serve as useful trap crops where there are only a few trees and all the berries thereon (with any fly maggots they may contain) are destroyed by carefully collecting and boiling or burning the berries; otherwise they become a menace, for though they prefer wild fruits, a percentage of the flies may infest the orchard fruit.

It must be mentioned, however, that the above refers to adjacent wild fruits. It is hardly necessary, and at the same time altogether too expensive and impracticable, to go abroad for miles into the scrub to destroy the thousands of native trees of the species I have named as developing fruit-fly in their fruits.

Fig. 1.—White Ash Tree *(Schizomeria ovata).*
Growing adjacent to orchards, and from the berries of which Queensland Fruit Flies were developed.

The larva (maggot) and pupa of this fly are figured in Part I, and are very similar to those of the Mediterranean Fruit-fly. The eggs hatch in a few days. The maggot stage appears to occupy two or three weeks. The pupal stage in summer occupies fourteen to twenty days. The adults may live several weeks. Thus from the laying of the egg to the adult stage occupies about five or six weeks in summer, and the flies living a week or two as adults, the total life may be two months or more. There may therefore be several generations in the summer. Cold, as was found in the case of the Mediterranean Fly, doubtless retards development during the winter.

Dates of appearance of Queensland Fruit-fly maggots in orchard and wild fruits.

Orchard fruits:—Early broods, September to December; late broods, January to early March.

Wild fruits: —September to November in Cheesewood Berries (*Acronychia lævis*)

November to February in Black Apple or Native Plum (*Sideroxylon australe*). This fruit varies in dates of ripening on trees 3 or 4 miles from one another.

February to April in White Ash berries (*Schizomeria ovata*).

March to May, occasionally in Wild Black Fig (*Ficus stephanocarpa*).

October, in Lillipilly berries (*Eugenia Smithii*): on one occasion only from Hornsby district, in Lillipilly berries sent by Inspector A. T. Hunter.

Amount of Infection.

The White Ash berries in our district are the most plentiful fruit, and also the most frequently infested by the fly. They are white berries, resembling lillipillies, with a single seed, and the trees reach 50 or 60 feet in height (see Fig. 1). A low estimate for an ordinary tree would be 20,000 berries. Fly infection of these berries, we find, varies from nil to 78 per cent. One maggot, rarely two, are found in a single berry; therefore, any number up to 15,000 or more fruit-flies may be developed by a single tree. The amount of infection in this wild fruit varies in different gullies. However, it is easy to imagine, with a great many trees producing thousands of flies, what enormous broods of this fly must be developed each year; and yet comparatively little orchard fruit has been destroyed during the past three years by the Queensland Fly which we are discussing.

The following table shows percentages of infection in White Ash berries collected in various places during February, 1910:—

From	540	berries,	258	Queensland flies	developed,	=	47·7	per cent.
,,	64	,,	50	,,	,,	=	78	,,
,,	905	,,	60	,,	,,	=	6·6	,,
,,	178	,,	55	,,	,,	=	30·8	,,
,,	48	,,	3	,,	,,	=	6	,,
,,	200	,,	6	,,	,,	=	3	,,
,,	1,000	,,	67	,,	,,	=	6·7	,,
,,	276	,,	56	,,	,,	=	20	,,

Only occasionally are there more than one fly maggot in a single berry.

Cheesewood trees (*S. lævis*) (see Fig. 2) are not so plentiful as White Ash trees, but may bear a heavy crop of berries and be heavily infested, as the following figures will indicate. The small tree in the photograph was growing a few hundred yards from the orchards. It was an isolated wild fruit-tree, and perhaps therefore became exceptionally heavily infested. We collected as far as practicable every berry, small or large, on the tree and

ground below, which amounted to three kerosene-tins full, or some 15,000 berries. We carefully counted the Queensland fruit-flies developed from these berries. The total was 12,075 flies. As very rarely more than one maggot is found in a single berry, this means that 80 per cent. of the berries were infested. There was little or no infection in adjacent orchards. This batch of flies was preserved in spirits. Upon separating them carefully the numbers of males and females were found approximately equal.

NOTES ON THE NEWLY DISCOVERED PARASITIC WASP (*Opius Tryoni*, Cameron) OF QUEENSLAND FRUIT-FLY.

This parasite is figured and recorded in Part I of these articles. Below is given a table showing in what wild fruits the Queensland fruit-fly maggots were feeding from which the parasites were developed, and incidentally the extent of the parasitism. It will be seen that from 4 to 52 per cent. of the Queensland fruit-flies developing in these particular fruits were destroyed by this parasite.

Only one parasite develops in a single fly maggot. The parasite does not at once destroy the fly maggot, which pupates first and then perishes, while the tiny adult winged wasp develops and emerges from the fly pupa in lieu of the fly.

Fruit.	When Collected.	Locality.	No. of Queensland Flies developed.	No. of Parasites developed.	Dates of appearance of adults.
	1910.				1910.
Black Apple	31 Jan. ...	Wamberal..	10	2	— Feb.
White Ash berries ...	1 Feb....	Narara ...	206	131	19 ,, – 7 Mar.
,, ...	4 ,, ...	,, ...	222	146	19 ,, – 7 ,,
,, ...	7 ,, ...	,, ...	258	81	19 ,, – 7 ,,
,, ...	7 ,, ...	,, ...	55	3	21 ,, – 2 ,,
Black Apple	8 ,, ...	Ourimbah ..	48	2	21 ,, –19 ,,
White Ash berries ...	8 ,, ..	,, ...	29	5	25 ,, –28 ,,
,, ...	8 ,, ...	Lisarow	11	2	25 ,, – 5 ,,
,, ..	22 ,, ...	Narara ..	65	71	7–26 Mar.
,, ..	26 ,, ...	Lisarow ...	67	3	15–26 ,,
Pupæ in soil under White Ash tree.	7 June...	Narara ...	Not noted	5	18 Oct.,–3 Nov.
,, ,, ...	7 ,, ...	,, ...	,,	2	25 Oct.
,, ,, ...	22 ,, ...	,, ...	,,	3	19 Aug.
,, ,, ...	8 July ...	,, ...	,,	2	24–29 Aug.
	1911.				1911.
,, ,, ...	29 Jan. ...	,, ...	10	4	14–20 Feb.
White Ash berries ...	4 Feb. ...	,, ...	50	5	18–22 ,,
,, ...	8 ,, ...	,, ..	60	9	6 Mar.
,, ...	15 ,, ...	,, ...	8	2	10–15 Mar.
Total	....	....	1,099	476	

How the Parasites pass the Winter.

It will be seen from the above table that certain Queensland Fly pupæ, dug in June and July from soil beneath White Ash trees, carried parasites which appeared after the winter, viz., in August and October. That a certain

percentage of parasites in the fly maggots in February and March do not at once hatch out is indicated by the following data. White Ash berries collected in March, 1910, yielded as follows:—(*a*) April, 1910—18 Queensland Flies; September, 1910—2 parasites. (*b*) April, 1910—19 Queensland Flies; September and October, 1910—18 parasites. (*c*) April, 1910—6 Queensland Flies; September and October, 1910—5 parasites. (*d*) Queensland Flies, not noted; September, 1910—6 parasites.

The Parasite occasionally infests Maggots in Orchard Fruits.

That the parasite will sometimes attack fly maggots in orchard fruits as well as in the wild fruits is evidenced by the facts that I developed a specimen from fly-infested citrus fruit from Grafton in the summer of 1907–8; and that also at Narara we developed a parasite from a fly-infested Seville orange.

Fig. 2.—Cheesewood tree (*Acronychia lævis*).
From the berries of which 12,075 Queensland Fruit-flies were developed.

The Parasite will attack Mediterranean Fruit-fly.

It seems possible that some of the parasites were developed in Island Fly and Mediterranean Fly as well as Queensland Fly. Some parasites put in with Mediterranean Fly maggots at this office died almost immediately without parasitising the maggots. But of some we experimented with at the Narara Insectarium, Mr. Gallard gives me the following notes:—

"During March, 1911, several live parasites were introduced with some fly-infested peaches. During April, 1911, there were hatched 1 parasite, 63 Mediterranean Fruit-flies, and 1 Island Fruit-fly.

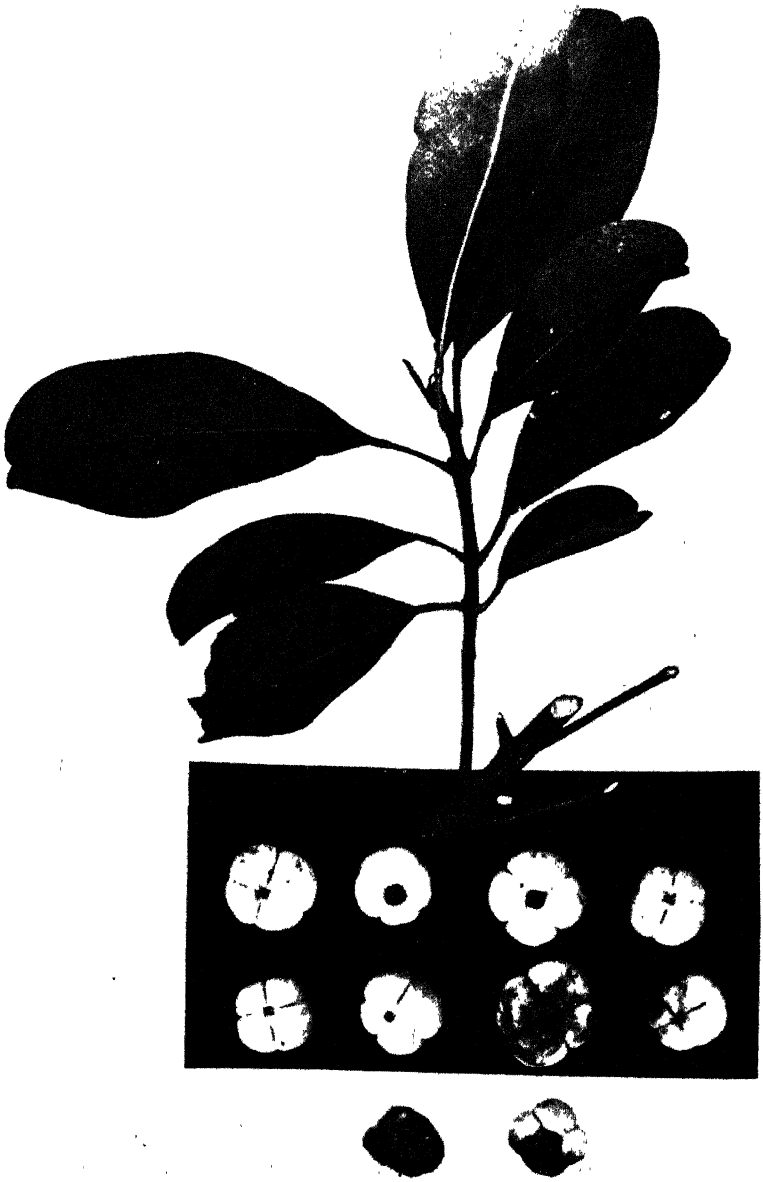


Fig. 3.—"Cheesewood" berries and foliage *(Acronychia lævis)*

(Somewhat less than natural size.) One of the wild fruits in which the Queensland Fruit-fly commonly develops.

Fig. 4.—Wild Black Fig *(Ficus stephanocarpa).*
the fruit of which Queensland Fruit-flies were found.

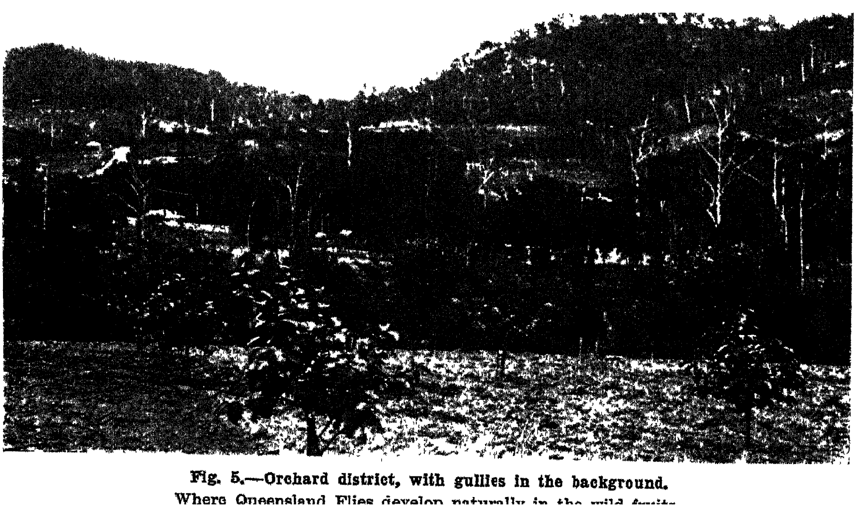


Fig. 5.—Orchard district, with gullies in the background.
Where Queensland Flies develop naturally in the wild fruits.

During October, 1910, 13 live parasites were introduced with some fly-infested mandarins and oranges. During November, 1910, two parasites developed; and during November and December, 1910, 25 Queensland Flies and 37 Island Flies developed.

The natural host of the parasite is Queensland Fruit-fly, but it will turn its attention also to Mediterranean Fruit-fly. Mr. Gallard reports developing it from Mediterranean Fly in Cumberland, and I now have a specimen of the parasite given me by Inspector A. T. Hunter, which he developed from one of two fly maggots taken from a peach at Wahroonga. The two maggots were isolated; one developed into a Mediterranean Fly, while from the other the new parasite (*Opius Tryoni*) developed. There seems little doubt that this was a case of infection of Mediterranean Fly in orchard fruit under natural conditions, and along with Mr. Gallard's and my own records, indicates that the parasite may yet, upon occasions, become a valuable check upon Mediterranean Fly.

(*To be continued.*)

Citrus Fruit, Pigs, and Poultry.

"W.B." asks the best district in which to undertake the growing of citrus fruits, pig-raising, and poultry-keeping combined; particulars of Crown lands available, and capital required.

Mr. Geo. Valder, Superintendent and Chief Inspector, states:—

There are many districts where these three occupations may be combined. Perhaps the best district to go to would be somewhere in the neighbourhood of the Hawkesbury River—say, for instance, between Gosford and Wyong. This district is suitable for citrus fruits, and crops such as maize, pumpkins, &c., can be grown for feeding to pigs and poultry. As it is also a dairying district, no doubt arrangements might be made to obtain supplies of skim-milk.

For particulars of Crown lands available, the Lands Department should be consulted.

It is difficult to state the exact amount of capital required, as so much depends upon the land obtained and the man who works it, but ordinarily a capital of £500 would be required.

Manuring Fruit-trees.

"W.T.W.," Junee, asks whether the fertilisers recommended for fruit-trees in Farmers' Bulletin, No. 17, would injure the roots of young trees in such a warm climate; also, how deep the hole should be dug.

The correspondent also asks the manurial value of ammonia fluid from the local gas works.

Mr. F. B. Guthrie, Chemist of the Department, replies:—

The manures recommended will not injure the roots of young trees unless brought into direct contact with them. The usual practice is to spread the manure, mixed with earth, around the tree a foot or so away from the trunk. There is no advantage in digging holes.

The ammonia from gas works varies a good deal in composition. Usually it is necessary to dilute it with eight or ten times its bulk of water. It is a good fertilising material if it can be obtained cheaply, but it is not a complete manure, and requires to be supplemented by superphosphate and potash salts. Owing to its variable composition, it is advisable to forward a sample for analysis before using it.

AN ORCHARD IN STONES.

MR. W. J. ROCHAIX, Howard's Grass, Lismore, has supplied the accompanying photographs of Mr. S. M. Patch's orchard of 3 acres. Not a vestige of soil is to be seen, the whole of the surface being covered with loose stones, but about 18 inches below the surface there is beautiful chocolate soil. The orchard includes apple, pear, persimmon, orange, lemon, peach, apricot, and other trees; whilst French beans, marrows, and other vegetables are grown by simply dropping the seeds into the crevices.

PREVENTIVE AGAINST INJURY FROM LATE FROSTS.

MR. A. MULLER, Ginahween, Eurunderee, states that last year practically all the grapes in his district were frozen, whilst his vines had a full crop. This was because he pruned his grapes when the young shoots were 6 or 8 inches long, and thus threw the vines back a month. He says he has now proved the value of this on several occasions. His vineyard is in the frost belt, and quite open and exposed.

Orchard Notes.

W. J. ALLEN.

AUGUST.

WINTER spraying should be commenced with the lime, sulphur, and bluestone solution, which is both an insecticide and a fungicide. Keep a sharp outlook for aphis on peach-trees. Resin and washing soda, tobacco-wash or Nikoteen will be found useful to keep this pest in check. Also keep a sharp lookout for the appearance of woolly aphis and mussel scale, and should any trees be found affected they should be carefully pruned, removing and burning as many of the infested twigs as possible. Spray thoroughly with red oil emulsion.

Keep all fruit-houses as clean as possible, as there is no doubt they are responsible for harbouring a great many moths every year.

Growers who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather make two applications—one now, and one after the fruit is set. In the drier districts, where late rains are uncertain, it is better to make the application earlier than late, as it is well known that they do not give the same results if applied when the soil is at all dry.

The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties.

It is surprising how few orchardists grow table grapes even for their own use. There is nothing more refreshing in the summer-time than a bunch of grapes, and every orchard should contain a small plot. The best varieties to grow in a cool district are as follow:—*White:* Royal Muscadine, Golden Chasselas, and Ferdinand de Lesseps; *Black:* Black Hamburg, Black Champion, Blue Imperial, and Muscat Hamburg.

Green manures should be ploughed under, so that the plant-food locked up in them may be available when the tree requires it to mature its fruit. If the green crop is left too late, moisture, which can ill be spared if the summer is a dry one, is pumped out. Plant young citrus trees.

Concentrated Lime-Sulphur Solution.

The concentrated lime-sulphur solution for the treatment of fungus diseases in pome and stone fruits is rapidly taking the place of Bordeaux mixture in the United States. It has been found that arsenate of lead may be added to the lime-sulphur solution with advantage.

The following formula is given in Bulletin No. 330 of the New York Agricultural Experiment Station :—

Lump lime	Pure CaO	36 lb.
	or	
	95 per cent. CaO	38 ,,
	or	
	90 per cent. CaO	40 ,,
Sulphur		80 ,,
Water		50 gallons.

This solution is stored, and diluted with water according to the purpose for which it is required. Growers interested should write to "The New York Agricultural Experiment Station, Geneva, N.Y., U.S.A.," for a copy of Bulletin No. 330.

Acknowledgments.

Some very fine specimens of Yates' apples were received from Mr. T. Hewson, of Penrose, and also from Mr. A. E. Brown, "Briardale," Mount Keira.

Mr. W. J. Moulder, "The Oaks," Camden, sent a photograph of a Pomme de Neige apple-tree in fruit. The tree carried fifteen cases in 1909, and twenty cases this year.

New South Wales Apples in Hamburg.

Mr. M. G. B. Jefferson, 196, Sussex-street, Sydney, representative of Messrs. Timm and Gerstenkorn, fruit salesmen, Hamburg, Germany, informs the Department that New South Wales apples, shipped at the end of February, 1911, realised as follows :—

Vessel.	Left Sydney.	Variety.	Price per case.	
			German money.	English money.
			M. P.	s. d.
S.S. "Schwaben" ...	24 February ...	Granny Smith... ...	11·60	11 3
G.M.S. "Barbarossa"	25 ,, ...	,, ...	11·50	11 2
S.S. "Rostock" ...	27 ,, ...	,, ...	12·50	12 2
do ...	27 ,, ...	Five Crown	14·25	13 10
do ...	27 ,, ...	Summer Pearmain ...	9·0	8 10

These shipments opened up in a satisfactory condition and met with a good demand. The season being at an early stage in February, shipment of more varieties was hardly possible.

Apples shipped from Sydney on 27th March, per "Oberhausen," averaged from 10·05 to 12 Marks per case, equal to from 9s. 9d. to 11s. 9d.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Alumny and Carr's Creek ...	Mr. A. R. Wetherspoon, Alumny Creek, Grafton.
Bathurst	Mr. S. McKibbin, O'Connell.
Carlingford...	Mr. D K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown...	Mr. S. A. Levick, Roseneath, Cundletown.
Frogmore	Mr. W. Thompson, Forest Creek, Frogmore.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Milbrulong	Mr. O. Ludwig.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Yass...	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The list above enumerates the places at which branches have already been formed. The members are receiving the advantage of courses of lectures by Departmental experts on subjects which are of interest to them. Every reader of the *Agricultural Gazette* should join the local branch, or arrange to have one formed in his district. He cannot afford to let go by him such an opportunity of acquiring up-to-date information of modern methods in regard to his business. If a branch of the Bureau does not exist in his neighbourhood, he should write to the Department, and steps will be taken to form one.

Bathurst.

One of the Veterinary Surgeons of the Department will lecture to the members of the Bathurst branch on "Horses," on the 15th August. The lecture will be at 8 p.m., in the Technical College Hall.

Carlingford.

Mr. G. Bradshaw, Poultry Expert, will deliver a lantern lecture to the members during the month of August.

Frogmore.

At a meeting held on 17th June, it was decided to form a branch of the Bureau at Frogmore. Mr. T. B. Prosser, J.P., is Chairman; Mr. T. Downes, Vice-Chairman; Mr. S. Gee, Hon. Treasurer; and Mr. W. Thompson, Forest Creek, Frogmore, Hon. Secretary. The annual subscription has been fixed at 2s. 6d. Thirteen members have joined so far. The Assistant Fruit Expert will give a pruning demonstration to the members on the 19th August.

Jiggi.

A branch of the Bureau has been formed at Jiggi, of which Mr. D. Gibson is the hon. secretary. The members, who are mostly dairymen, propose to instal a Babcock tester in the public school, and Mr. Balhausen, the Dairy Instructor for the Richmond River district, will visit and give the required instruction in the use of the machine.

Katoomba.

The fruit-growers and farmers in the Katoomba district have been successful in forming a branch of the Bureau, and have commenced with a membership of twenty-five. The membership fee has been fixed at 5s. per annum.

Mr. Bryant, the Assistant Fruit Expert, lectured here on 1st July, on "Pruning."

Keepit, Manilla.

The branch just formed at Keepit consists of twenty-one members, with Mr. J. H. Fitzgerald as Chairman; Messrs. W. Schaeffer and M. F. Fitzgerald as Vice-Chairmen; Mr. J. R. Watts, Hon. Treasurer; and Mr. J. B. Fitzgerald, Hon. Secretary.

Little Plain.

Mr. A. H. E. McDonald, Inspector of Agriculture, gave an illustrated lecture on "Wheat-growing," on 6th July. Despite the very wet weather which prevailed, about twenty-two members attended, some of whom travelled

a distance of over 5 miles to be present. In his lecture Mr. McDonald dealt with the nature of the soil, the importance of humus, the necessity of early ploughing and cultivation, treatment of seed wheat, suitable varieties for the district, and the eradication of black oats.

The Department regret to hear of the impending resignation of Mr. H. C. Stening, the hon. secretary to the branch, owing to his departure from the district. The success of this branch has been mostly due to Mr. Stening's enthusiasm.

Milbrulong.

Twenty-five members have joined a new branch which has been formed at Milbrulong, the Chairman being Mr. J. Lynch; Vice-Chairman, Mr. T. A. Bauer; Hon. Treasurer, Mr. F. W. Gollasch; and Hon. Secretary, Mr. O. Ludwig. The subscription fee has been fixed at 2s. 6d.

Orchard Hills (Penrith).

The new branch at Orchard Hills, near Penrith, commences with a membership of twenty-six. Mr. J. Turner, of St. Mary's, has been elected Chairman; Messrs. R. Rankin and M. McLennan, Vice-Chairmen; Mr. J. Dickson, Hon. Treasurer; and Mr. H. Basedow, Orchard Hills, *viâ* Penrith, Hon. Secretary. The annual subscription is 1s., and the meetings are to be held in the Public School every Thursday night nearest full moon.

Parkes.

Parkes branch records a falling off in interest in the meetings among the men most concerned. After the first enthusiasm has died away, which often occurs in connection with anything novel, it may be only natural for interest to wane somewhat; and it will depend upon the officers to see that the Bureau be kept alive by placing before the members matters for discussion which will appeal to them.

In this connection the Department will be glad to have from the members of the various branches any suggestions which they may have to offer as to what should be done by the branches and the Department to make the Bureau of real and abiding use to the farmers of the State.

Walla Walla.

Owing to the unfortunate illness of the Orchardist at Wagga Farm, a pruning demonstration, which had been arranged for the 5th July, had to be postponed to the 21st July, when Mr. Bryant, Assistant Fruit Expert, gave the demonstration.

Walli.

Mr. Mathews, Sheep and Wool Expert, will continue his course of lectures and demonstrations to the members of the branch on the 10th August, when the third lecture of the series will be given.

Yass.

The lectures on "Sheep and Wool" by Mr. Mathews, Expert of the Department, were continued at Yass before large audiences on the 15th and 27th July.

Department of Agriculture,
Sydney, 2nd August, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

JERSEYS.—***Patron:** sire, Calceolaria's Lad; dam, Lady Pat; calved 27th September, 1910; colour (whole), dark fawn. Price, **£25.**

Lady Pat is from Pattibelle by Sir Jack. Pattibelle from Claribelle (imp.) by Lily's Boy (Vol. IX, p. 86, E.J.H.B.).

***The Sphinx:** sire, Calceolaria's Lad; dam, Sailor's Pride; calved 7th October, 1910; colour, fawn and white. Price, **£20.**

Sailor's Pride is from Egyptian Belle by Sir Jack. Egyptian Belle is from Egyptian Princess (imp.) by Tidy Punch, from Lady Tidy III, by Melbourne Punch.

AYRSHIRES.—***Julius Caesar:** sire, Auchenbrain Spicy Jock (imp.); dam, Julia; calved 7th January, 1910; colour, brown and white. Price, **£15.**

Julia is from Juliette by Peacemaker. Juliette from Judy IX of Barcheskie (imp.) by Mischiefmaker (imp.)

***Drummond:** sire, Auchenbrain Spicy Jock (imp.); dam, Juliette; calved 12th May, 1910; colour, brown and little white. Price, **£15.**

HOLSTEIN.—**Kiel:** sire, Hollander; dam, Lolkje Zuyder Zee; calved 22nd May, 1910; colour, black and white. Price, **£25.**

SHORTHORNS.—**Royal Pansy:** sire, Royal Hampton X (imp.); dam, Australian Pansy; calved 8th December, 1909; colour, red roan. Price, **£50.**

Australian Pansy is by Airy Knight II from Pansy IV (imp.).

Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

HAWKESBURY AGRICULTURAL COLLEGE.

AYRSHIRE.—**Dado:** sire, Daniel of Auchenbrain (imp.); dam, Dot, by Hover of Southwick (imp.), from Flirt, by Heir of Randwick (imp.), from Lady of Randwick; calved 23rd March, 1904; colour, white and brown. Price, **£15.**

WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—**Adonis:** sire, Prince Souvia; dam, Beauty of the Brickfield (imp.): calved 10th November, 1910. Price, **£45.**

Lord Hopetoun: sire, Parson's Hope; dam, Souvenir of Wollongbar; calved 24th October, 1910. Price, **£45.**

Romulus: sire, Prince Souvia; dam, Rosey VII (imp.); calved 31st August, 1910. Price, **£45.**

JERSEYS.—**Maro:** sire, First Choice; dam, Marjory Newman; calved 27th August, 1910. Price, **£20.**

Oceanus: sire, First Choice; dam, Seaweed; calved 12th August, 1910. Price, **£20.**

First Choice is by Melbourne from Lady Tidy (imp.).

AYRSHIRES.—**Cheviot's Chief:** No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown. Price, **£15.**

Lord Russell: sire, Lucky Getter (imp.); dam, Belladonna of Russelly; calved 18th June, 1910. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—**The Judge** (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS for Sale, Grafton Experiment Farm.

Name.	Sire.	Dam.	Date of Birth	Price.
				£
Milkmaid ...	His Worship ...	Dairymaid II ...	6 July, 1905 ...	25
My Love	The Judge	Her Loveliness ...	19 March, 1904 ...	25

H. C. L. ANDERSON, Under Secretary.

* Applications for these bulls will be held till 21st August. If more than one application be received for any one bull his disposal will be decided by ballot.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ..	Pansy 4th (imp.).	Wollongbar Farm	*
,, ...	March Pansy .	Earl March .	Australian Pansy	Grafton Farm ...	*
Jersey	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie .	Berry Farm ..	*
Guernsey ..	Gentle Prince ...	Rose Prince (imp.)	Gentle (imp)	Trevallyn... ..	20 Sept., '11.
,, ..	The King's Mirror.	Calm Prince .	Vivid (imp.)..	Lismore	20 Nov., '11.
,,	Star Prince ..	Calm Prince .	Vivid (imp.).	Dunoon	1 Dec., '11.
,,	Sky Pilot ..	Prince Souvia .	Parson's Red Rose (imp.)	Palmer's Island ..	12 April, '12.
,,	Prince Souvia ..	Vivid's Prince..	Souvenir(imp.)	Casino	30 Dec., '11.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras	Milton	1 Nov., '11.
,, ..	Monsieur Beaucaire.	Calm Prince .	Flaxy (imp.)	Grafton Farm ...	*
,, ..	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar ...	*
,, .	Claudius ..	Golden Star II.	Claudia's Pride (imp.)	H.A. College, Richmond	*
,, .	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ..	,, ,,	19 Dec., '11.
,, .	The Peacemaker	Calm Prince ..	Rose Petersen	Berry	25 Aug., '11.
,,	King of the Roses	Hayes' King ..	Rose 8th (imp.)	Singleton	22 Oct., '11.
,, ..	Calm Prince ..	Rose Prince (imp.).	Gentle (imp.)	Berry	*
,, ...	Royal Preel ..	Otchen Royal ..	Hayes' Lily du Preel (imp.).	Murwillumbah ...	20 Nov., '12.
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ..	Berry	*
Ayrshire	Royal Prince ..	Curly Prince ..	Rosie 5th ..	Grafton Farm ..	*
,, ..	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, .	Jamie's Ayr ..	Jamie of Oakbank.	Miss Prim ..	Wollongbar Farm.	*
,, .	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose..	H.A. College, Richmond	*
Kerry... .	Kildare II ..	Kildare (imp.)..	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ..	Aicme Chin (imp.).	Bratha 4th .	,, ,,	*
,, ...	Rising Sun ..	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
National A. and I. Association, Brisbane, Queensland	C. A. Arvier	Aug. 7–12
Bogan Gate P. and A. Association	B. M. Lowing	,, 8
Trundle P. and A. Association	L. Todd	,, 10, 11
Corowa P., A., and H. Society (Annual Show)	J. D. Fraser	,, 15, 16
Forbes P., A., and H. Association	J. H. Bates	,, 16, 17
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 22, 23, 24
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 22, 23, 24
Parkes P., A., and H. Association	G. W. Seaborn	,, 23, 24
Murrumburrah P., A., and I. Association	J. A. Foley	,, 29, 30
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 29, 30
Wellington P., A., and H. Society	A. E. Rotton	,, 29, 30, 31
Barmedman A. and H. Association	P. H. Sheahan	,, 30
Grenfell P., A., and H. Association	G. Cousins	,, 30, 31
Young P. and A. Association	G. S. Whiteman	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys	,, 6, 7
Ariah Park P., A., H., and I. Association	J. N. Taylor	,, 6, 7
Northern A. Association (Singleton)	F. A. Bennett	,, 6, 7, 8
Cowra P. A. and H. Association	J. T. Martin	,, 12, 13
Cootamundra A., P., H., and I. Association	T. Williams	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith	,, 13
Canowindra P., A., and H. Association	G. Newmon	,, 19, 20
Temora P., A., H., and I. Association	W. H. Byrnes	,, 19, 20, 21
Moama A. and P. Association	A. E. Bartlett	,, 23
Henty P. and A. Society	H. L. Yates	,, 26, 27
Ganmain A. and P. Association	J. H. Ashwood	,, 26, 27
Millthorpe A. and P. Association	R. H. French	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther	Oct. 4
Adelong P. and A. Association	A. W. Molineaux	,, 10, 11
Pooncaira P. and A. Society	N. McLeod and F. J. Windsor	,, 11
Hillston P. and A. Association	S. I. Gordon	,, 19
Lismore A. and I. Society	T. M. Hewitt	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd	,, 8, 9

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser	,, 17, 18
Kiama A. Association	R. Somerville	,, 26, 27
Berry A. Association	C. W. Osborne	Feb. 7, 8
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Dapto A. and H. Society	J. H. Lindsay	Mar. 1, 2
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	,, 7, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25

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VOL. XXII. PART 9. SEPTEMBER 2, 1911.

Agricultural Gazette of New South Wales.

A New Wheat District.

PALLAMALLAWA.

A. H. E. McDONALD, Inspector of Agriculture.

THE onward march of the plough and the harvester is often hindered by various obstacles. Sometimes it is lack of a speedy and cheap means of transport; sometimes fear on the part of men that the rainfall is not sufficient for crop requirements; while sometimes, mingled with these is the greater obstacle of want of knowledge on the part of those who are already in possession of the land, of its possibilities, and the right methods of developing them to their own substantial profit. It is the last-named cause which is responsible chiefly for the slowness with which settlers along the Inverell railway, some few miles out of Moree, are taking up wheat-growing.

The extraordinary prosperity which has followed the extension of this industry has resulted in the cultivation of wheat being undertaken, more or less, with good or indifferent success in almost every district where by any stretch of the imagination it could be conceived possible that the crop would thrive. We have learnt so much during the last few years that it would be expected that all the favoured districts of the State would have had their true value assessed. Since we have such ready means of intercommunication between the different districts of the State, and between States, it is remarkable how slowly values adjust themselves, and how long it is before a locality is admitted within the circle of safe wheat districts. The differences in values between the northern and southern portions of our own State, and between it and other States, illustrate this. When we study the yields of the wheat crop in other States, and in our own, and compare them, we cannot see any justification for the comparatively low market value of land in our own State. In the north-western district men from the older wheat-growing States are frequently met with who emphatically assert that they would rather have one acre of the land than two in the districts from which they came, while at the same time they obtained the land at half or less than half what they would have had to pay had they bought there.

All this tends to show that there is not that equality in wheat land values which results indicate should exist. In the north-west, for instance, the fertility of the soil is such that, although the land is cropped almost continuously, the average yield is practically similar to that of South Australia, where a regular system of a year's fallowing has to be adopted.

Since, therefore, even established wheat districts do not receive full justice, it is not unduly remarkable that there should be good wheat districts which have escaped attention. Again, the improvement in our methods, and the

evolution of more hardy varieties of wheat are exerting a tremendous influence upon our minds, and it is possible that what one looks upon as safe wheat districts to-day were far from being thought so a few years ago. Possibly, at some future date we will consider safe, districts which to-day we regard with suspicion. Be that as it may, we have within our borders large areas of land which are capable of abundantly producing wheat, and from which, owing to lack of appreciation of their productivity, only insignificant quantities are produced.

What is it that makes a good wheat district? Broadly, we may say it is rainfall and soil. It is practically impossible to fix arbitrarily the amount of moisture required to produce a crop of wheat—on one class of soil a certain quantity may be ample, while on another it may be totally inadequate. A certain type of soil in a district with a heavy rainfall may be an excellent wheat soil; yet the same class of soil in a district with a small rainfall may be quite useless, while in the same districts soil may exist which gives excellent yields. The possibilities of a district are determined by the amount of rain, especially the period of its fall, and the capacity of the soil for moisture. A district with a 10-inch rainfall during the growing period may produce quite as good yields as one with a 12-inch rainfall—the difference being due to greater capacity of the soil of one for holding and retaining moisture. A district, therefore, should not be condemned because it lies so many miles westward of established wheat districts and has a slightly lower rainfall.

Twenty miles from Moree, on the Moree-Inverell line, is a small siding called Biniguy. The siding is on the left-hand side, and the traveller, looking from his window, sees a plain which, if he is a wheat-grower, has very little interest for him. Seven miles from Biniguy is the small bush village of Pallamallawa, on the banks of the Gwydir. Pallamallawa people are within 3 or 4 miles of the railway siding of Wubbera, but the impassibility of the road compels them to go to Biniguy. The Gwydir, near this village, is a noble stream of water, and has great possibilities for the irrigationist.

Not many people go to Pallamallawa. The country surrounding it is given up to grazing, and much of the business is done through Moree. It is set down on the black alluvial flats, and the wheat-grower passing that way would still see little to attract him. Two or three miles out of the village, however, the character of the country changes. The level black soil gives place to a higher and very slightly undulating red loam country. The soil is equal, or superior, to that found in any other part of the north-west. The surface soil is from 9 inches to 1 foot deep, and overlies a clay subsoil. It is a mixture of sand and clay, so proportioned that it has a high capacity for moisture, while at the same time the sand is sufficient to prevent the soil setting too compactly, and consequently drying out rapidly.

In addition to an agreeable mixture of sand and clay, the soil contains a large percentage of decayed organic matter or humus. For many centuries the native forests flourished, and the dense growth of belah, wilga, box, and pine has enriched the soil by the shedding of leaves. The leaves have been

gently falling to the earth for many generations, and have left it in a very kindly condition for man's handiwork.

Nearly all this country was at one time part of the great Boggamilldi run In its heyday, that station had a length of 75 miles and a width of 30. The green timber was ringbarked, grass grew luxuriantly, and at times tremendous bush-fires devastated the country-side. Under their fierce breath the dead timber was reduced to ashes; and were it not for the existing dense belts of green timber, chiefly belah, left to serve as fire-breaks, it would be impossible to believe it was once so thickly timbered that it was almost impossible to ride through the bush.

A few years ago many of the Boggamilldi leases were cancelled or expired, and the land was surveyed into blocks ranging from 500 to about 4,000 acres. At the time they were taken, the importance of wheat-growing was not realised as fully as it is to-day, and the selectors, chiefly men who had previously been engaged in pastoral pursuits, either as station hands or on their own account, turned their attention naturally to sheep and cattle. They have not had amongst them one who was an experienced wheat-farmer, and consequently the land was not put to that use for which it is naturally so well adapted.

If it be admitted that the climate is somewhat drier than that of districts where wheat is already largely grown, it must also be admitted that nature has been very kind, and has given a soil which is capable of off-setting the slight deficiency of moisture. According to records, however, the rainfall is fairly good. The average rainfall of Moree, 20 miles to the west, is 23·79 inches, while that of Warialda, 30 miles to the east, is 28·07 inches. The chart issued by the Commonwealth Meteorologist shows that from April to October the rainfall at Moree is 11·59 inches, while at Warialda it is 13·75 inches. As 10 inches during the period mentioned may be regarded as a fair rainfall, this district is well treated. At the same time, it receives an excellent summer rainfall, and the nature of the land is such that, during the present season, I was thoroughly convinced, through personal examination, that it has a far higher capacity for retaining moisture than soil in the Gunnedah, Tamworth, or Manilla districts. Its power in this respect is, in fact, somewhat extraordinary, and occasioned me much surprise.

The reason that the district has not progressed is not far to seek. It stands in splendid isolation; and, further, attempts which have been made at wheat-growing have not been made seriously. The grave mistake appears to have been made in the past of selecting the strong black soil of the Gwydir banks for wheat-growing. The result has been what might have been expected—some good crops have been obtained, but often the return was discouraging. This class of soil is not suitable for wheat. The strong soil encourages a rank growth, which is extremely susceptible to drought; frosts are more likely to damage the crop; and it is also liable to rust.

As wheat has also been sown only when other duties permitted, the land has generally been badly prepared, and the crop oftentimes sown late.

Despite this, however, some excellent yields have been obtained. From 20 to 32 bushels of grain and as much as 3 tons of hay per acre have been harvested.

Latterly, wheat-growing has received a decided impetus through the energy and determination of Mr. A. J. Blunt. After carefully considering the matter, and conferring with the Department of Agriculture, he selected an area of some of the best red soil, cleared it, and got together a complete plant for growing and harvesting the crop. He placed the work in the hands of one of his sons, and this year has over 100 acres in crop. The land has been well prepared, the very best varieties have been selected, and everything done to thoroughly test the district

Other growers have also enlarged their areas, and it is probable that nearly a thousand acres will be under crop this season. Amongst these are Messrs. P. and A. L. Kelman, Hayes, Webster, Coppock, Burling, Jones, Macey, and Harris.

Wheat experiment plots have been established in the district by the Department of Agriculture, and are doing much to encourage farmers in their enterprise. The outcome of it all will assuredly be that another district will be added to our wheat-growing area. As it is estimated that there are about 50,000 acres of good wheat land in the district within fairly easy reach of the railway, this will be an important addition to the acreage of New South Wales devoted to the cereal.

Stack-building at Wagga Experiment Farm.

A. F. FULLER, Farm Foreman.

WE have been building our haystacks at Wagga Farm for some years now by a method which has some very definite advantages. The tedious work of thatching is avoided, whilst the roof is so constructed that no rain which we are likely to get in this dry district can enter the stack. The only portions exposed on the roof are the butts of the sheaves, and the loss which occurs from this exposure is very small indeed. A few surface straws will be rotted at the butt, but the actual loss does not amount to 1 per cent. of the roofing sheaves.

Then again, the sides are all built butts outwards, and are so bound that the slope is downwards and outwards. Rain beating on the sides cannot enter the stack, as to do so it would need to run upwards. The ground sheaves are all placed butts downwards, so that any loss occasioned by soakage from the ground through the straddle will also be confined to the butts.

Our stacks have suffered no damage from the wind. The corners are bound by a system of overlapping sheaves, which has enabled the stacks to withstand the hardest winds which we have experienced at the Farm.

The work of building the stacks is simple. Of course, stack-building is one of the fine arts of farming, and a novice cannot build any kind of stack without a good deal of practice; but it is claimed that this method is a vast improvement in the direction of simplicity. One of our 45-ton stacks is built and finished off in a day by two men—with others, of course, carting the sheaves from the paddocks.

The oblong stack is preferred to the round form, as it is easier to top up. A new hand working on a round stack will often find it bulging before he reaches the full height, and he will have some difficulty in keeping a true circle. But we do build round stacks at Wagga, following the same principles, and with excellent results. Those who prefer the round form, and have had experience of the work, will find no difficulty in adapting these notes to that form of stack.

The size of stack which we find the most convenient is 12 yards by 6 yards, built 14 feet to the eaves. The capacity is 45 to 50 tons. The stacks which we are now breaking up have been standing through all weathers for seventeen months, and have compacted to such an extent that the eaves are about 10 feet from the ground; yet the stacks have remained quite perpendicular. They have suffered no damage from wind or rain, and the loss of butts on the outside is not worth mentioning.

After selecting a good site, level and dry, measure off the ground 12 yards by 6 yards, and build a good straddle of straw, sticks, or other suitable

material which may be handy. You can start from the centre or from the outside, but it is simpler work to start from the outside, and this is our general practice.

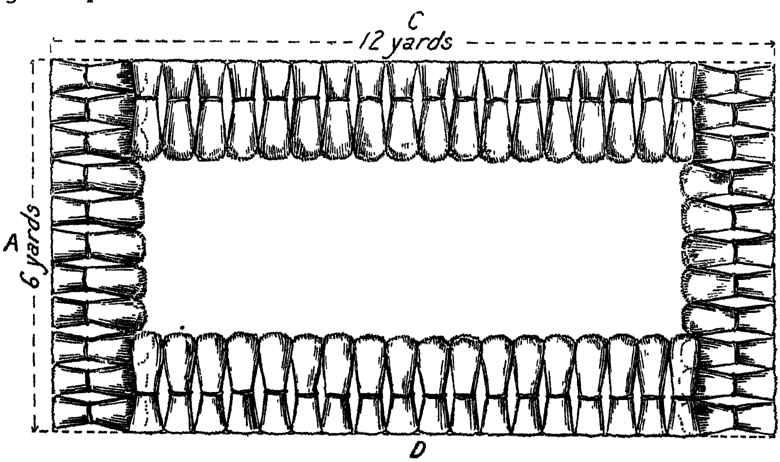


Fig. 1.—Commencing the stack.

Fig. 1 shows the easier method of commencing the stack. First of all, place a layer of sheaves on the ends, A and B, butts outwards, and running lengthways with the stack. Then lay sheaves along the sides, C and D, butts outwards, running across the stack and overlapping the heads of the end sheaves. These are the only sheaves which will be placed flat on the ground.

Another method of commencing, which is not quite so simple, is shown in Fig. 2, and provides for binding the corners of the first tier. The first sheaf, A, is placed at an angle, pointing towards the centre of the stack. The next sheaf overlaps the head of the first, and the third that of the

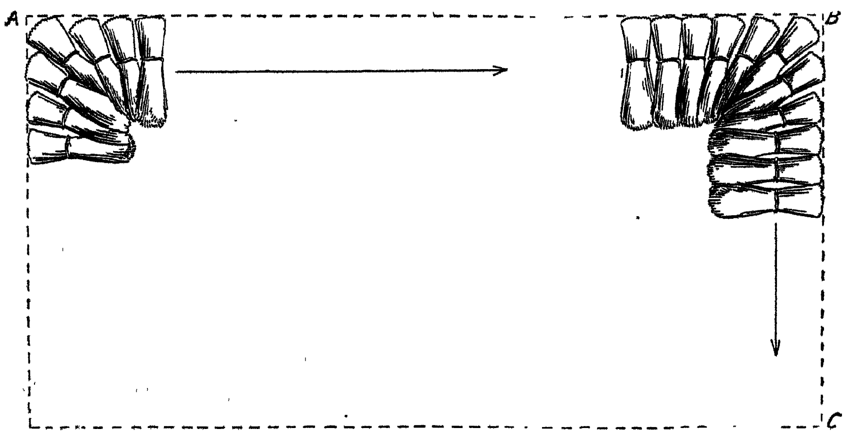


Fig. 2.—Another method of commencing the stack.

second, and so on, until the sheaves are lying straight across the stack. As the corner B is approached, the butts are spread and the heads overlapped to bind the corner. Then the sheaves are straightened again along the end, B C, and so on around the stack.

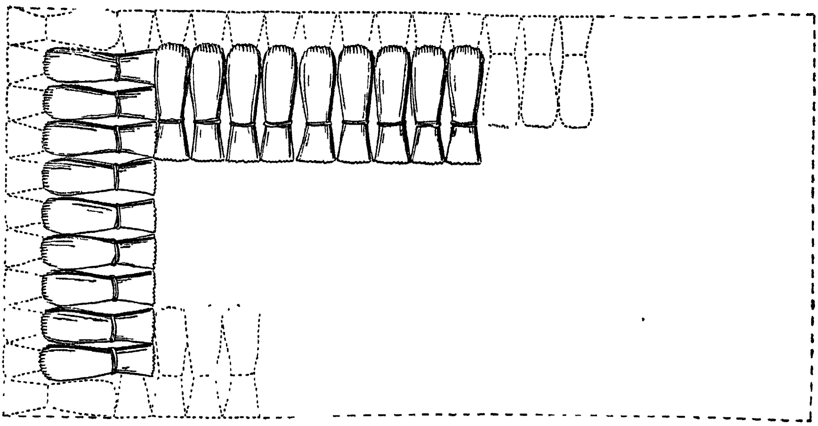


Fig. 3.—Filling up the centre of the first tier.

In filling up the centre of the first tier, always place the butts on the ground. The dotted lines in Fig. 3 show the sheaves first laid. Fill up by placing sheaves heads outwards, overlapping the bands of the first layer. Continue around the stack, and then commence again in the centre, always placing the butts on the ground, until the centre is filled.

The second, or binding tier, is laid upon the first tier of sheaves exactly as shown in the second method of commencing the stack (Fig. 2). A start may be made at the corner, or in the centre of the end, working to the corner. The usual method is to start at the corner. Place butts outwards to the edge (Fig. 4), and bind the corners by laying the sheaves at an angle.

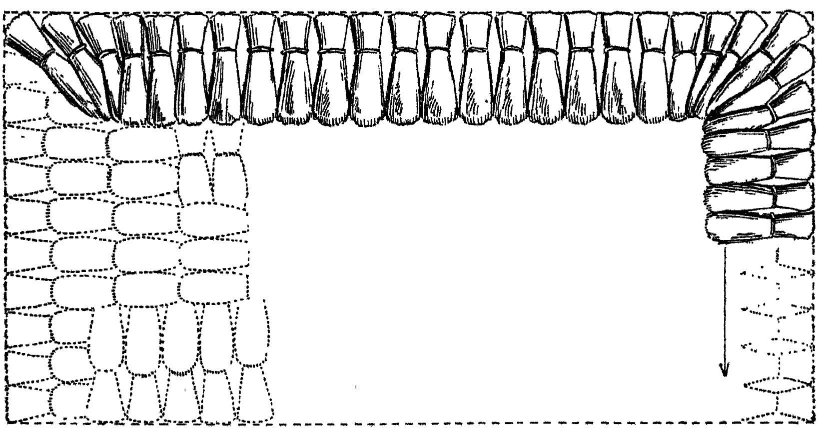


Fig. 4.—The second, or binding, tier.

Lay the sheaf flat, and close the head somewhat. In finishing, just go far enough to catch the head of the sheaf first laid.

The centre of the second tier is filled by placing sheaves butts outwards and well up to the bands (Fig. 5). In this portion of the work a good deal of judgment has to be exercised. The aim is to keep the centre of the stack a little, but not too much, above the edges. In a stack of this size the centre should be kept about a foot higher than the edges. This is obtained by placing the centre sheaves farther out or farther in as required. To make the stack fuller in the centre you place the sheaves farther out; to make it more level you draw them in. As the filling proceeds, the stack always looks as if it were going to have a hollow centre, but the next layer fills it up. It may require a little practice to see exactly how far out to place the sheaves, so as to get the centre the right height.

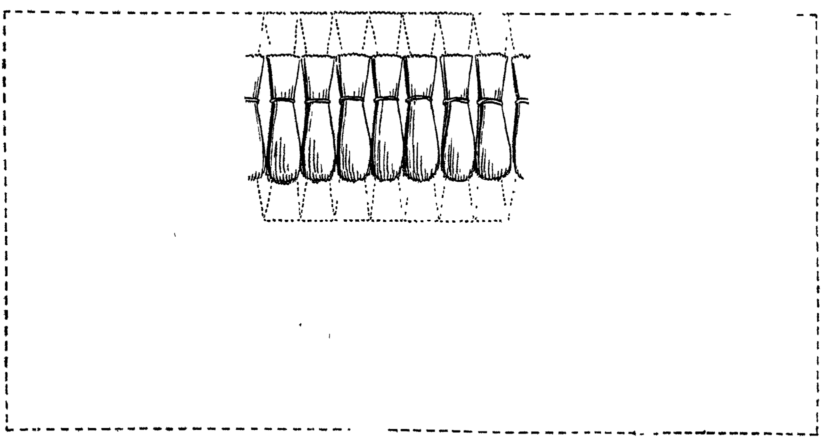


Fig. 5.—Filling up the centre of the second tier.

The following tiers are all put on the same as the second, binding with the butts outwards, and keeping the centre high. If rain beats upon the sides it would have to travel upwards to get into the stack. In the case of a wheat stack, the water would need to travel upwards the full length of the sheaf before it could injure the grain.

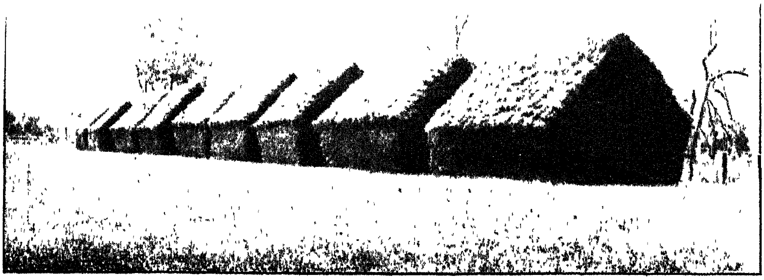
In commencing the third tier, place the corner sheaf at an angle with the first sheaf of the second tier. Looking at Fig. 4, it will be seen that the corner sheaf slopes towards the bottom side of the stack. When putting on the corner sheaf of the third tier, slope it towards the right end of the stack, making an angle with the lower one. This will make the corner secure.

A good stack-builder will always keep the sides of his stack perpendicular. The stack has a tendency to spread as it rises. Do not draw the sheaves in, but use a board about 15 inches x 12 inches, with a handle about 6 feet long (Fig. 6), and beat the edges in with this.

Zealand Wheat in stooks.

Carting to stack.

Building the stacks.



The finished stacks.

The Platform.

A fair average roofing-sheaf, taken from a stack which had been standing for seventeen months.

These are the most exposed sheaves on the stack.

The same sheaf after brushing off the rotted trash, which is seen on the ground.

This is practically the only loss in the whole of the stack.

Photos. by Geo. L. Sutton.

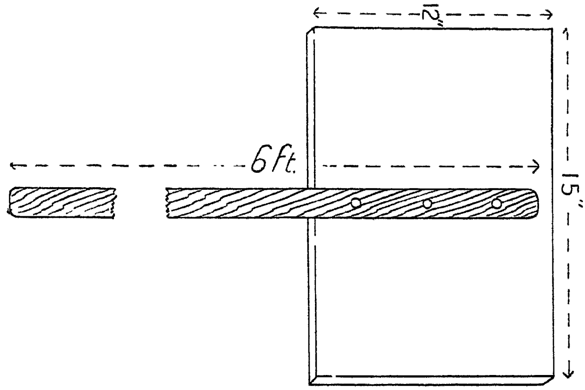


Fig. 6.—Board for squaring off edges of stack.

The stack is built 14 feet to the eaves. A platform (of which a photograph is given) is used for reaching the higher levels. This is made light and strong, and can be readily moved by two men to any required position.

The second last tier is laid so that the sheaves overhang the sides about 3 inches (Fig. 7). The ends are flush with the other end sheaves. There is no hip to the roof of our stacks—it is a straight gable. The heads of the corner sheaves are bound in so as to support the corner of the roof. The last tier is laid level on the edges with the second last one, binding the corners as explained above. This forms a good eave.

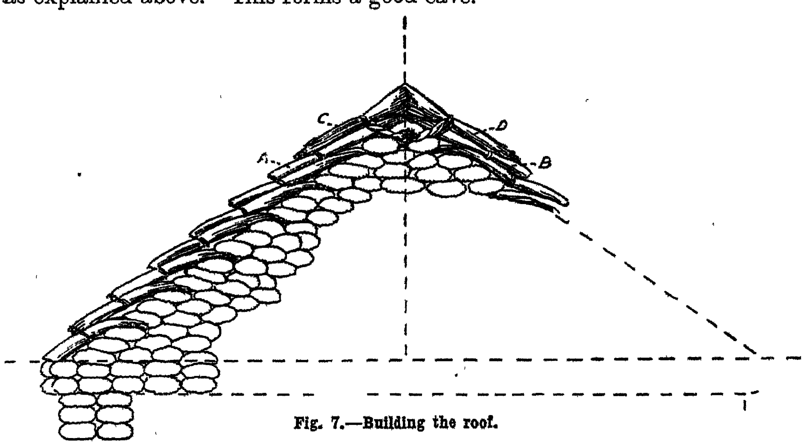


Fig. 7.—Building the roof.

Now we come to the top and roof of the stack. The construction requires a little explanation, but it is hoped that the sketches will enable the reader to grasp the method. The aim is to build a gable roof in such a manner that butts only will be exposed, except at the cap, and the whole made firm and strong.

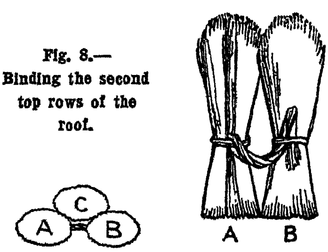
All the top sheaves are laid lengthways on the stack, butts outwards at the ends. You can bind in the centre by laying them either way. Start from the edge and work along the stack. It will take about twenty sheaves to run the length of the stack.

Commence the first row about 1 foot in from the eaves. Build all the rows of this layer right across, and then commence the second layer a little farther in. Judgment must be used to give the roof the correct pitch. When about three layers have been built in this way, place the first row of roofing or thatching sheaves in position. They are placed butts downwards on the eaves, the heads resting over the top of the portion of roof already built. If the sheaves are long, four layers of roof may be required before placing on the first thatching sheaves. Lay these thatching sheaves right along the stack on both sides.

Now build three more layers of the roof. Before placing the first row in position, press the heads of the thatching sheaves down upon the stack and bind them in. (See Fig. 7.) When these three layers have been built, put on another row of roofing or thatching sheaves, butts downwards, just covering the bands of the first layer, and resting the heads over the stack as before. Proceed in this way, working both sides together, until the ridge is reached It will be seen that only the butts of the thatching sheaves are exposed.

Always use well-bound sheaves for covering the stack in this way, as these are the ones which have to stand the weather. We always ask the carter for a good load to top the stack.

Fig. 8.—Binding the second top rows of the roof.



The ridge requires binding together, and the method of doing this is shown in Fig. 8. The second top layer will consist of two rows of sheaves lying side by side, as A and B. Take a handful of straws from both sides of the band of sheaf A and stick it into the band of sheaf B. Repeat this right along the top. It keeps the top from spreading. Then the ridge, C, the last row of sheaves, is put on, and the stack is capped.

The last two rows of roofing sheaves, coming up the roof one on each side, are placed butts downwards like the rest, so that the heads meet on the top over the ridge. These are shown as A and B in Fig. 9. On top of these place two more sheaves, C and D, butts *upwards*, to act as a cap. Take a handful of straw from each side of the band of

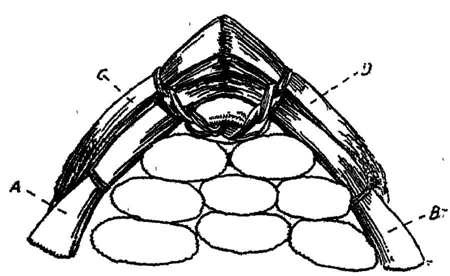


Fig. 9.—Capping the ridge.

each sheaf, roll them tightly, and twist the two together, turn the twist underneath, and push it hard into the end of the stack.

The capping sheaves, butts upwards, are carried along the ridge on both sides. To bind the capping sheaves along the ridge, take a handful from sheaf B (Fig. 10), break it back at the band, and stick it into the band of sheaf A from the top. Continue this along the ridge on both sides; it pulls the sheaves together and makes the cap fast.

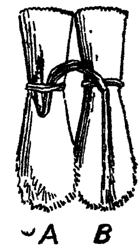


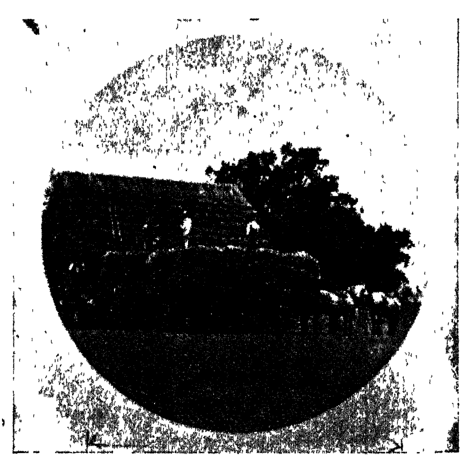
Fig. 10.—Binding the capping sheaves.

As a further precaution to protect the stack from the wind, stick a peg into the second capping sheaf from the end in a direction sloping in towards the stack. Draw a string from this peg over the first sheaf, and tie it to a peg stuck in the end of the stack. You may now knock off for tea, and be ready to start another stack in the morning.

Before I came to Wagga Farm I used to earn my living as a thatcher; but I have never thatched a haystack at Wagga, and would never do it in this dry district. There is no need for it. Our stacks have stood for three years without thatching, with no loss worth mentioning. Stacks have been thatched near this Farm by so-called "good thatchers" which have had far more waste than the unthatched stacks on the Farm. In moister districts, where thatching is necessary, I should build my stacks by this method and then thatch them.

In stacking wheat to thresh, we proceed exactly as with hay, but we do not need to spend so much time, as the stacks have not to stand so long. We merely throw the sheaves together in the order explained.

Straw stacks had better be thatched. It is possible to build them without thatching by keeping the middle well up, but it is a more difficult job than with hay, and a novice is not advised to attempt it.



Harvest on New England Tableland.

R. H. GENNYS, Manager, Glen Innes Experiment Farm.

Wheats.

SEVERE frosts and cold winds gave all the crops a severe set-back last season, and most of the wheats suffered; several varieties, such as Comeback and Bayah, very severely.

Haynes' Blue-stem stood out as the best frost resister, for after the severe frosts in October it appeared uninjured, and yielded at the rate of 34½ bushels to the acre of good grain in a 6 acres plot.

Comeback, in a plot of 4 acres in the same paddock, and under like conditions, was cut right off; a second growth yielding only a light crop of hay. It was unfit to cut for grain.

Jonathan, in another paddock, appeared to suffer a good deal from frost, but afterwards made a fine recovery, and yielded 25½ bushels of grain to the acre, but the grain was injured through excessive rains. Jonathan should not be sown too early—say, about the middle of June; but Haynes' Blue-stem should be sown as early in May as possible.

Genoa resisted frosts fairly well, and made a good recovery. It is a promising variety, when sown early.

Generally, Haynes' Blue-stem appears to be the best variety for hay and grain. Jonathan is suitable for grain only, while the new variety, Genoa, is a grain wheat, and also a good hay sort.

Full advantage of fine weather should be taken in New England to harvest all straw crops.

Oats.

Algerian and *White Tartarian* oats have proved our two best varieties for hay so far. Though they appeared to suffer from the late frosts, they quickly recovered, and looked fine crops when heading; but the continuous wet weather, lasting on and off from Christmas to the beginning of March, completely spoilt the colour and marketable qualities, and much grain was also lost from both varieties in the field through being over-ripe. As the paddocks were so boggy after the heavy rains, machines could not be worked for some time after rains ceased.

Algerian has led for some years in production of grain; for hay, it is short, sweet, and fine.

White Tartarian is purely a hay variety, and is suitable for chaffing purposes. It yields heavily, is of excellent colour, but not so sweet as Algerian.

In the straw crops, varieties should be selected that are frost-resistant, rust-resistant, and good yielders. Any that take long to mature should be sown early.

Crops that can be harvested before Christmas are generally the safest in New England.

Bunt and Germination Experiments.

STUD-WHEAT PLOTS, WAGGA EXPERIMENT FARM, 1910.

ROBERT J. HURST.

EXPERIMENT No. I.

EXPERIMENTS conducted at the Stud Wheat Plots, Wagga Experiment Farm, with bluestone, bluestone and salt, and formalin, to determine their effectiveness in the killing of bunt spores, and also their influence on the germination of the wheat

Preparation of Fungicides used.

(1) *Bluestone Solution.*—Made by dissolving 2 lb. of bluestone in 10 gallons of water. Seed immersed for five minutes and allowed to dry before planting.

(2) *Bluestone and Salt.*—Made by adding 2 lb. of coarse salt to the above bluestone solution. Seed immersed for five minutes and allowed to dry.

(3) *Formalin Solution.*—Made by adding 1 oz. of formalin to 28 lb. of water, or 1 lb. formalin to 45 gallons water. Seed immersed for five minutes and allowed to dry.

Method of Infecting Grain with Bunt.

The method adopted was to take a quantity of bunt-balls, crush them up in a suitable vessel, then place in the packets containing the seed sufficient of the crushed bunt to thoroughly infect every grain. The packets were then well shaken.

Results.

The following table shows the effect which the fungicides had in destroying bunt spores, and preventing reinfection; also their effect upon germination:—

TABLE I.

No.	Variety.	Treatment.	Grains Sown.	Plants Matured.	No. of Plants. Bunty.	Clean.
1	Bunyip ...	Bunt-infected, then treated with fresh formalin solution.	100	94	0	94
2	„ ..	Bunt-infected, then treated with formalin solution two weeks prepared; kept during that time in a kerosene tin covered by wheat-sack.	100	91	0	91
3	„ ..	Bunt-infected, then treated with bluestone.	100	75	0	75
4	„ ...	Bunt-infected, then treated with bluestone and salt.	100	82	0	82
5	„ ...	Bunt-infected—Not treated	100	94	54	40
6	„ ...	Treated with bluestone, then bunt-infected.	100	75	5	70
7	„ ...	Treated with bluestone and salt, then bunt-infected.	100	64	1	63
*8	Zealand ...	Treated with formalin, then bunt-infected.	50	46	43	3
*9	„ ...	Treated with bluestone, then bunt-infected.	90	64	15	49

* As it was known that formalin does not prevent reinfection, it was left out of the experiment. These results have been taken from an experiment conducted in 1909.

From the above table, it will be observed that each of the fungicides tested was successful in killing the bunt spores, but none was absolutely proof against reinfection. Bluestone and salt proved slightly more effective than bluestone in this respect, but both killed approximately 25 per cent. of the grain. Formalin is of little use as regards preventing reinfection, but proved superior to the other two in its effect upon germination.

Formalin has been successfully used here in the wheat-breeding plots since introduced by the late William Farrer in 1900. It has never had any marked effect on the germination, and tests have shown that seed may be treated and kept for any reasonable length of time without affecting its vitality.

It will also be noticed that formalin solution, after being prepared for two weeks, was as effective in killing the bunt spores as fresh formalin solution.

In 1902 the majority of the stud wheats were treated with bluestone, but the results were unsatisfactory.

EXPERIMENT No. II.

The object of this experiment was to ascertain whether barley-grass bunt would attack wheat.

Some of the barley grass growing in the district during the previous year was badly infested with bunt. The appearance and smell of the bunt spores were similar to those of wheat bunt, and it was thought by some wheat-growers that they were identical.

Two bunt-liable varieties of wheat were chosen for this experiment, and two rows of each were planted, one row of each being infected with wheat bunt and the other with bunt taken from barley grass.

At the time of examination all the plants in the two rows infected with barley-grass bunt were found to be clean, and appeared to look healthier than adjacent clean rows. The two rows infected with wheat bunt were very much diseased, as Table II shows.

TABLE II.

Row.	Variety.	Treatment.	Grains Sown.	Plants Matured.	Plants	
					Bunty.	Clean.
1	Bunyip ...	Infected with wheat bunt	100	99	64	35
2	,, ...	Infected with barley-grass bunt ...	100	97	0	97
3	Zealand ...	Infected with wheat bunt	100	98	95	3
4	,, ...	Infected with barley-grass bunt ...	100	98	0	98

A noticeable feature in this experiment was the marked difference in the two rows of Zealand. The seed planted was from the same source, yet they appeared, from germination and throughout growth, to be two distinct varieties. This difference was due to one row deing diseased (bunt-infested) and the other healthy. The plants in the bunt-infected row in their young

stage showed slightly darker coloured foliage, and more erect growth than those of the healthy row. At maturity the plants in the healthy row were considerably taller than those of the diseased row.

EXPERIMENT No. III.

This experiment was to determine the effect on germination of the fungicides used. The solutions used for treating the seed were prepared similarly to those described under Experiment No. I.

It will be noticed from Table III that some of the wheats used for this experiment had been treated for over twelve months, with either bluestone or formalin. The formalin-treated seed germinated as well as untreated seed, and much better than seed treated with bluestone or bluestone and salt just before planting. The action of bluestone and salt on the vitality of the grain appears to be very erratic, from 18 to 54 per cent. of the grain being destroyed. Bluestone, however, is not so erratic, but has in each case destroyed about 25 per cent. of the grain.

TABLE III.

Row.	Variety.	Fungicides used.	Date of Treatment.	No. Seeds Sown.	No. Germinated.	Percentage Germinated.
1	Bunyip ...	Bluestone...	3-6-10	100	73	73
2	,, ...	Bluestone and Salt ...	3-6-10	100	73	73
3	,, ...	Formalin	2-6-10	100	95	95
4	,, ...	Not treated	......	100	93	93
5	Firbank ...	Formalin	8-5-09	62	60	96
6	,, ...	Bluestone and Salt ..	12-5-10	50	23	46
7	Comeback...	Formalin	May, '09...	100	92	92
8	Zealand ...	Bluestone...	July, '09...	100	44	44
*9	,, ...	Formalin	May, '09...	50	48	96
*10	,, ...	Bluestone...	July, '09...	61	46	75

* Result taken from an experiment conducted in 1909.

EXPERIMENT No. IV.

The object of this experiment was to determine whether the spores of unbroken bunt-balls would retain their vitality unimpaired from one season to the next.

Two rows of Bunyip wheat were planted—Row A being infected with bunt that had been harvested in 1908, Row B with bunt that was harvested in 1909.

The plants in both rows, when matured, proved to be very much diseased. In Row A, of 100 seeds sown, 99 plants matured, 64 of which were bunty and 35 clean. In Row B, of 100 seeds shown, 94 plants matured, 54 being bunty and 40 clean.

The results from this section, when compared with those of Experiment No. I, will serve to illustrate to what extent the variety Bunyip is liable to be bunt-infected, if no fungicide is used. In this case bunt alone, although it had a marked effect on the growth of the plants, did not affect the germination of the seeds.

EXPERIMENT No. V.

On 31st May a short drill was opened and heavily infected with crushed bunt-balls, giving the bottom of the drill a black appearance, then very lightly covered. On 7th July, five weeks later, 100 grains of Firbank wheat were planted in the drill, the grains being pressed in to where the bunt spores had been placed. The drill was then covered in the ordinary way. From this row 96 plants matured, and all were free from bunt.

The rainfall from date of placing bunt spores in the drill till the grain was planted, amounted to 504 points.

It may be assumed from this test, that under ordinary weather conditions, bunt spores in the soil readily germinate and die unless they find a host.

EXPERIMENT No. VI.

In February a bunted ear of wheat was placed in water for about one week, then exposed to the sun for several days. At planting time the bunt balls were removed and crushed, and used to infect 100 grains of Bunyip wheat, which were planted. The result showed 93 plants, of which 71 were bunty and 22 clean.

The object of this experiment was to ascertain if continued soaking would burst the bunt-balls, or if the water would penetrate the covering and cause the spores to germinate. Apparently this soaking had not sufficient injurious effect upon all the spores to render them incapable of infecting the wheat plant.

Under the conditions prevailing at the stud plots at the Wagga Experiment Farm, formalin has proved the most suitable fungicide yet used.

NOTE BY THE LATE WHEAT EXPERIMENTALIST.

The consistently good results obtained at the Wagga stud plots are remarkable, when considered in connection with the variable and unsatisfactory results obtained elsewhere. Under the conditions prevailing at Wagga, formalin is almost an ideal fungicide.

Unfortunately, equally good results are not obtained elsewhere, neither in experiment plots nor on farms. It may be that some peculiarity of the soil is responsible for the different results; or, it may be that the good results obtained at Wagga are due to the character of the seed used in the experiments The seed used is all hand-threshed, and it is therefore not likely to be injured, even slightly, as is likely to be the case when the grain is harvested by either stripper or thresher.—Geo. L. Sutton.

Some Disputed Points in Australian Agriculture.

MR. CLAUDE SAUNDERS, of Windsor, has raised some very interesting questions in regard to which the experience of Australian farmers appears to differ materially from the teachings of older lands. We have much pleasure in publishing Mr. Saunders' queries, together with answers supplied by Departmental experts.

Farmers who observe such apparent differences between theory and practice should always communicate with the Department of Agriculture. We must remember that this is the "land of topsy-turveydom," compared with the countries in which most of the theories of agriculture have been developed. Not only are the seasons reversed, but our climatic conditions are so entirely different from those of Europe and large sections of North America, that it is often to our interest to test by field experiment what appears to be the most commonplace truth. The main objects of British farmers, it has been pointed out, are to get moisture out of the soil and warmth into it; and indeed the great majority of agricultural scientists in the older world are struggling with these two problems. Comparatively few farmers in Australia can afford to neglect precautions for retaining moisture in the soil, and we are accustomed to harvest most of our crops before the full heat of summer is reached. The dry lands of North-western America have lately been cited extensively as resembling the interior of Australia. The fact that in those regions farmers have to select varieties with a short growing period, so as to be able to harvest them before the snows of winter set in, makes the comparison ridiculous.

We have, therefore, to determine a great number of points in agriculture for ourselves. Practical experience is a slow and costly method; scientific experiment is rapid and comparatively cheap. The proper authority to conduct the experiments is the Department of Agriculture, with its organisation of Experiment Farms throughout the State.

Hence we welcome such communications as those of Mr. Saunders. His main questions are now given, together with answers based upon experiments made by the Department. Fortunately we are now able to at once answer most of the points raised; but readers are cordially invited to notify the Department of any other directions in which it occurs to them that investigation would be beneficial to the State.

Green Manuring.

Question.—Professor Massey, the American expert, is reported in a Sydney paper as saying: "In the Southern States, ploughing in a green legume (cowpeas) does not benefit in a warm climate as in a cold. The green matter turns the soil sour." He recommends the crop being fed-off, harvested, or allowed to die down before cultivation. How far is this experience true of Australia?

Answer (by Mr. F. B. Guthrie, Chemist).—I have not heard that there is a tendency for the ploughing under of green crops to render the soil sour in warm climates, nor do I think that that is our experience.

Warmth and *moisture* promote the rapid decay of green manure, and it is possible that the production of humic and other acids may, under certain conditions as to warmth and moisture, proceed so rapidly as to render the soil sour, especially if the subsoil is impervious. This, however, would not be likely to occur in warm and *dry* climates, where the vegetable matter is liable to be burnt out without forming humus or humic acids.

In a cold *moist* climate the conversion of vegetable matter into humus would proceed more slowly and equably, and there would not be the same risk of an accumulation of acid substances.

Question.—A survey of results of green manuring in our dry lands should be instructive. Have these results paid the extra cost?

Answer (by Mr. Geo. Valder, Superintendent and Chief Inspector).—Green manuring has proved very profitable on lands in our coastal districts, and for fruit-growing in all districts; but for crops in the drier areas, such as our principal wheat-growing centres, feeding-off has proved more beneficial, and far more profitable, than green manuring. As a result, one rarely hears of farmers in these districts ploughing a crop in, but large areas are sown with rape, cowpeas, field peas, tares, barley, &c., and these crops are fed-off. Green manuring is rarely practised, except for fruit-growing, in other than the coastal districts, and even in the coastal districts feeding-off sometimes gives better results.

Nitrogen and Wheat.

Question.—Repeated experiments have shown that the addition of nitrogen is rarely beneficial to the local cereal crop, while the European crop is said to depend on it. Equally with cold countries, we want superphosphates; but of nitrates, even in poor soil, the want seems to be much less, the cause being, I think, so far unexplained. If added nitrogen does not help wheat, there appears no logical reason for growing a legume to supply it; any good humus crop should do just as well for humus purposes.

Answer (Mr. Guthrie).—The explanation of the difference in the effect of nitrogenous manuring to the wheat crop in Europe and America as compared with Australia lies, I think, in the fact that during the early growth of the plant in the former countries the land is devoid of nitrates; whereas with us the growth of the plant takes place at a time when the formation of nitrates in the soil is most abundant. This is fully dealt with in the *Farmers' Bulletin*, No. 16, "Manures and Manuring."

A further point is, why is superphosphate so extremely beneficial? I believe the cause of this will be found to be that phosphates particularly favour root-development, and so enable the young seedling to functionate rapidly and vigorously.

[NOTE.—The Experiments Supervision Committee, at the instance of Mr. R. W. Peacock, Manager of the Bathurst Experiment Farm, have already

arranged for a series of experiments to test the comparative values of legumes and non-legumes in rotation with wheat. It will, of course, be some years before the results are available.—ED.]

Subsoil Drainage.

Question.—In a moist climate there is no question as to the benefit of subsoil drainage; but does the benefit, if any, in a dry climate justify the expense?

Answer (by Mr. Valder).—Subsoil drainage is only profitable in dry climates where intense culture is carried on, as for fruit-growing or market gardening; and then only in special cases where the natural drainage is bad. With most soils in dry districts, subsoil drainage will not pay, a few surface or open drains being all that is necessary.

Depth of Ploughing.

Question.—I meet a number of wheat-growers. They say the idea of deep ploughing for wheat is fallacious; on new soil, scratch your crop in; following years, scratch or plough deeper, till you come to the limit, 4 inches. This verdict is so general, and yet so contrary to the alleged advantages of deep cultivation, as to claim attention and examination.

Answer (by Mr. Valder).—The depth to plough depends upon the depth and condition of the surface soil. Most of our wheat soils give the best result with a rather shallow ploughing, say 4 inches; but in others, 5 to 6 inches pays best.

Experiments carried out by the Department over a number of years indicate that a very slight advantage is to be gained by ploughing deep rather than shallow, but the differences recorded were so slight that the only conclusions to be drawn are that deep ploughing some time prior to planting does not injuriously affect the yield, and that subsoiling has not proved advantageous.

Shelter Belts.

Question.—Tree shelter against winds is largely advocated. You will be told that in the Hills district, County of Cumberland, the orchards are dying or dead because the bush has been destroyed; yet at Galston, Dural, and Kenthurst, unsheltered orchards on hill-tops are thriving. A man who has worried out this problem concludes: "That the advantage of shelter from wind is greatly over-estimated, and the great value of an adjacent bush to fruit-trees is that the bush equalises the temperature—frosts are avoided, or are never so bad near big trees as in the open." This explanation seems to fit the facts, and one would like to know if it is true.

Answer (by Mr. Guthrie).—The benefit of tree shelters is to check undue evaporation of water from the leaves of the crop. This evaporation is most rapid in hot, dry, windy weather. A shelter belt, besides breaking the force of the wind, also cools and moistens it. It is also true that it equalises the temperature, as Mr. Saunders suggests, and reduces frosts.

The Ayrshire *v.* the Jersey.

Question.—Here is a point where local experience contradicts theory. The Ayrshire is counted a poor-country cow, the Jersey a good-country beast. Inquiring from a score of dairymen from different parts of this State, their verdict is to the contrary—the Ayrshire a failure except on good country; the Jersey standing hard times and poor feed better than any other breed.

Answer (by Mr. M. A. O'Callaghan, Dairy Expert).—Of the various problems raised by Mr. Saunders, the dairying one will probably afford most conflicting evidence, for the simple reason that the information which Mr. Saunders or any other person will receive on the point raised will be given by farmers from their experience, not of pure-bred representatives of the breeds, but of merely cross-breds.

Mr. Saunders states that the Ayrshire is looked upon as a cow suitable for poor country, while the Jersey requires good country. As a matter of fact, I have never heard of any such statement as the latter having been made by any person of experience.

Neither breed is the most suitable for rich country, and if bred on rich country for a number of generations, these breeds would lose their special characteristics. They would become very much larger in size, unless some artificial methods, such as early breeding, were adopted to restrain development.

Both the Ayrshire and the Jersey are suitable for light country; the difference between the two being that under severe weather conditions, the Ayrshire shows itself to be the hardier breed. A visit to the Hawkesbury Agricultural College should satisfy Mr. Saunders that the Ayrshire is a beast which does well on poor country. Provided the grass is sweet and succulent, the Jersey will do well even on very light country, and, when acclimatised and bred in cold regions for a number of generations, they naturally show themselves to be very much hardier than is the Jersey as it is known in the British Isles.

Deterioration in Federation Wheat.

The Minister of Agriculture recently received from a Wyalong grower a sample of Federation wheat which has been grown from the same seed for four years. The sample was milled by Mr. F. B. Guthrie, the Departmental Chemist. The wheat was of rather low bushel-weight, and the flour considerably lower in strength than is usual in this type of wheat.

Very much, however, depends upon the wheat being kept quite pure. The Department raises fresh stud seed of all recommended varieties annually, and this seed is sold in small lots to farmers. The strength of the varieties will be kept up in this way.

Farmers are advised to obtain small lots of pure seed from the Experiment Farms, and grow their own seed for the following season, harvesting the seed area separately. It would be impossible for the Department to raise enough pure, graded seed every year to sow 2,000,000 acres.

A New Pest of Salt-bush.

WHITE FLY (*Aleurodes atriplex, n. sp.*).

WALTER W. FROGGATT, F.L.S., Government Entomologist.

EARLY in May, Mr. J. D. Holding forwarded specimens of salt-bush from Broken Hill, very badly infested with a new pest, covering the whole of the underside of nearly every leaf. On examination, this proved to be one of the "Snow," or "White Flies" (family *Aleurodidæ*), that has never previously been recorded upon this valuable fodder plant. These tiny microscopic insects, closely allied to the lerp insects on the one hand and the scale insects on the other, are a very well-defined family of the Homoptera. They form tests or coverings like the scale insects, but whereas in the scale insects only the male is winged, both sexes of the adult snow flies have two pairs of well-developed wings. They take their popular name from the fact that their wings are thickly covered with a fine white dust, so that on an infested plant the whole under-surface of the foliage is often quite white from the countless numbers of little insects in hiding.

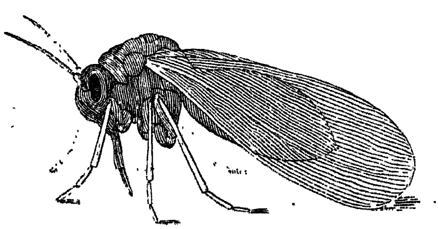


Fig. 1.—Snow-fly (*Aleurodes atriplex*) a new pest of Salt-bush. (Enlarged.)

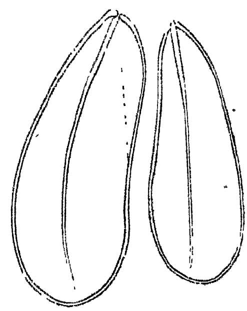


Fig. 2.—Wings of Snow-fly.

A number of interesting species are peculiar to Australia, feeding upon our native plants, but up to the present we have never known one to become a serious pest. In other parts of the world, however, several injurious species are only too well known. *Aleurodes citri*, the "white fly" of the citrus orchards of Florida, is one of the most difficult pests that the orange-growers of that State have to deal with; and when about five years ago it suddenly appeared in some gardens in California, the Horticultural Commissioners spent a considerable amount of money in cutting down and burning all the infected trees. It is, therefore, well to be prepared for any such enemy that might spread through such a valuable fodder plant as the salt-bush.

The whole of the under-surfaces of the salt-bush leaves, right from the tip of the branches, were encrusted with the eggs and tests of this insect. The eggs were oval in form, and shining dull-brown in tint.

The freshly-emerged larvæ do not move far from their birthplace, but set to work, and burying the tip of the beak-like mouth in the tissue of the leaf, commence to pump up the sap. They lose their outline in a little casket-like lerp shell, that encloses them and fits close to the leaf.

This larval and pupal test is semi-transparent, but appears to be yellow from the tint of the enclosed larva ; and in the well-developed pupæ the little red dots, indicating the eyes, can be seen through the shell, which shows the transverse segmental divisions, giving it a distinctly ribbed appearance. These tests are convex above, oval in form, sometimes slightly pointed towards the apex, and are fringed with a more or less broken rim of short truncate plates, of a semi-transparent wax-like substance.

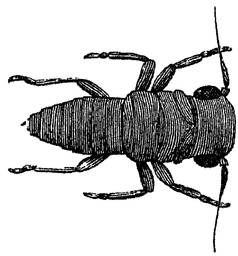


Fig. 3.—Larva of Snow-fly. (Enlarged.)

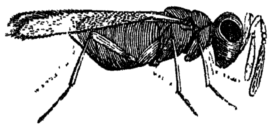


Fig. 4.—Chalcid Wasp, parasite of Snow-fly. (Enlarged.)

The perfect insect emerges through an opening down the centre of the test. It is a delicate, soft, yellow insect, with bright red eyes, and the wings pure white before they become rubbed. The legs, antennæ, and elongated mouth (rostrum) are semi-transparent; the tarsi and tip of the rostrum clouded with black. The perfect insect only measures $\frac{1}{20}$ of an inch. The head is narrow, eyes large, antennæ long, the rostrum very long and stout in proportion to the head. The details of the structure are much better shown in the illustrations than they can be described.

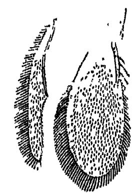


Fig. 5.—Wings of parasite.

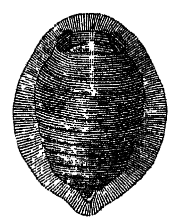


Fig. 6.—Pupa of Snow-fly, under test or shield.

A tiny yellow chalcid wasp was bred out in considerable numbers from the tests of this white fly, and is probably a large factor in the control of this pest under ordinary conditions.

Suggestions.

If this pest were to spread over large areas of salt-bush it might do a great deal of damage, for it would be impossible to treat it by spraying. Burning all infested plants and shrubs was the method adopted in California when the white fly of the orange appeared in that State, and it would probably pay to isolate and destroy any infested patch of salt-bush in a similar manner.

Farmers' Experiment Plots.

Summer Crops, Season 1910–1911.

MAIZE FODDER EXPERIMENTS ON THE SOUTH COAST.

R. N. MAKIN, Inspector of Agriculture.

The sowings of the maize fodder crops on the South Coast were somewhat delayed during the last season owing to the dry spring. In the case of some of our plots difficulty occurred in getting the farmers to plough sufficiently early.

In all cases I advise farmers to plough up a paddock or two in June or July, and let the land lie fallow, occasionally working the fallows by harrowing to keep in the moisture. There would then be no trouble in spring in planting seed early should the season prove to be a dry one.

Another point in connection with South Coast soils generally is the absence of humus or vegetable matter. Humus plays a great and important part. It helps to retain the moisture in the soil and keeps it in fine condition for working, so much so that where it is in sufficient quantities little difficulty is experienced with clods.

All the maize paddocks which I have yet seen on the South Coast are deficient in humus. This is brought about by removing the maize as green feed, or else burning the old maize stalks after the grain crop is harvested. Many farmers are now using artificial manures, which stimulate the soil for a time, and while a certain amount of humus remains in the soil some result may be obtained; but when it becomes exhausted, the manures fail to act and are then condemned. I have pointed this out to them and have advised them to use leguminous crops, such as cowpeas, field peas, clovers, &c., for renovating purposes.

In restoring a maize paddock it is a good plan to run a drill of cowpeas between the rows of maize after the final cultivation (the corn planter sows cowpeas well); or to sow red clover broadcast after the last cultivation. There is a considerable amount of feed left from the shoots at the base of the maize stalks; and as the leguminous crop often makes a good growth, the farmers obtain a valuable supply of fodder by this method. If the stock are turned in and the crop fed-off, it greatly improves the soil for the following crop.

Most of our crops for fodder and ensilage were sown in drills about 2 feet 6 inches apart, and thickly in the drills. The fine stalk and the small cob resulting from a thick sowing both go through the ensilage cutter better than the coarse growth from a thin seeding.

Our best returns were from a plot at Mrs. Read's Kent Farm, Central Tilba, where Yellow Dent gave 45 tons 14 cwt. 1 qr. per acre manured,

against 37 tons 11 cwt. 1 qr. per acre unmanured. The land was the average hill land round Tilba, of a sandy nature, very suitable for maize.

Another plot of Mr. J. Bate's, Tilba Tilba, was unfortunately destroyed by a plague of caterpillars. The whole of our plots suffered after sowing owing to the dry weather, but when the heavy rain came in January they made very rapid growth. The Berry Stud Farm plots were totally submerged by flood-waters, and caterpillars followed, absolutely ruining the crop. At Unanderra, Moss Vale, Milton, Albion Park, and Pambula, the crops gave splendid results. Of course, the soils varied considerably—the sandy loams giving the best returns. The increased yield due to the use of artificial fertilisers in the manurial trials were so satisfactory that local farmers were convinced of the benefits to be derived from the application of manures.

Taking the varieties separately, there is no doubt that *Yellow Dent* is the best variety for ensilage for the lowlands on the coast, while *Hickory King* proved the most satisfactory for early fodder. For the highlands—Moss Vale, Robertson, Bombala, and Braidwood—Hickory King stands easily first on account of its quick growth. At Mr. P. H. Throsby's farm, Moss Vale, we got a splendid return of 27 tons 12 cwt. 3 qrs. from this variety. It was very high and fine in the stalk. It attained this weight in a little over four months. At Robertson this same variety came highest in a trial of six varieties.

The American variety, *Marlboro Prolific*, yielded well in some cases, giving as high as 34 tons per acre. It is a very good maize for fodder or ensilage, but is not as early as Hickory King. When it becomes properly acclimatised it may possibly give higher yields. Both of these are white varieties.

Yellow Moruya grows a very coarse stalk, is a slow grower, and similar in many ways to Golden King. Both these varieties having a broad starchy grain, a plate with a large-sized hole in it is needed to sow them successfully with the corn-planter. Neither of them will stand comparison with Yellow Dent or Hickory King on account of their being so late in maturing.

Red Hogan gave some good returns—over 34 tons per acre at Unanderra and Central Tilba, and 37 tons at Pambula. It also grows rather coarse, and is slower than Yellow Dent in maturing.

It is very satisfactory to note the increase in the conservation of the maize crops as silage. Farmers, particularly round Tilba and Dapto, have been busy in this direction, and now at Tilba one can count the farms that have no silos, they are so few. Farmers should now study the balancing of rations and the growing of mixed fodders. It is intended during the coming season to conduct experiments with maize and cowpeas sown in conjunction, to produce fodder with an evenly balanced feeding ratio.

The following is the list of growers who carried out the experiments :—

Porter Bros., Camden.	R. Read, Central Tilba.
G. Langley, Albion Park	L. Garrard, Milton.
J. H. Martin, Pambula.	J. Curtis, Robertson.
J. Bate, Tilba Tilba.	J. W. Gorrell, Unanderra.

RESULTS OF MAIZE FODDER TRIALS, SOUTH COAST, 1910–1911.

Variety.	Camden.	Albion Park.	Pambula.	Tilba Tilba.	Central Tilba.	Milton.	Unanderra.	Robertson.	No. of Trials.	Average.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q	t. c. q.	t. c. q.		t. c. q.
Red Hogan	19 8 3	14 14 1	37 2 3	7 8 2	36 4 2	10 5 2	34 16 1	15 10 2	8	21 18 3
Funk's Yellow Dent...	....	....	34 5 2	....	....	....	....	....	1	34 5 2
Marlboro Prolific ..	16 5 1	16 0 0	20 0 0	10 5 2	34 4 2	10 9 1	....	15 17 0	7	17 11 2
Yellow Moruya ...	16 5 1	12 14 1	33 8 2	6 17 0	35 2 3	9 14 1	21 14 1	....	7	19 8 0
Local	....	....	36 11 1	....	....	8 14 1	....	....	2	22 12 3
Hickory King ..	14 9 3	8 14 2	....	8 8 2	33 14 1	8 11 1	20 13 1	18 0 0	7	16 1 2
Yellow Dent	14 4 2	18 2 3	....	11 8 2	45 14 1	8 17 0	26 17 0	12 5 2	7	19 12 3
Early Leaming ..	....	....	....	....	....	....	....	11 5 2	1	11 5 2
Iowa Silvermine ...	....	....	....	....	....	....	....	13 11 1	1	13 11 1

Manure Experiment.

Variety.	Camden.	Albion Park.	Pambula.	Tilba Tilba.	Central Tilba.	Milton.	Unanderra.	Robertson.	No. of Trials.	Average.
No manure ...	14 18 3	16 8 2	....	11 2 3	37 11 1	8 0 0	21 14 1	....	6	18 15 3
M 1	14 4 2	18 2 3	....	11 8 2	45 14 1	8 17 0	26 17 0	....	6	20 17 1
M 4	19 1 3	13 13 1	....	....	....	....	....	....	2	16 7 2

SUMMER CROPS FOR GRAIN AND SILAGE, WESTERN DISTRICT.

MARK H. REYNOLDS, Inspector of Agriculture.

THE harvesting of the fodder crops, maize, sorghums, cowpeas, and soy beans, sown separately and in different combinations, was completed by 31st March; and considering the somewhat dry conditions at four of the plots until tasselling time, may be considered satisfactory. The yields of different varieties of maize specially sown for grain will be submitted later.

Locality of Plots.	Area of Plots.	Date sown.	Date harvested.	Previous crop.
	acres.			
S. Patterson, Wattle Vale, Parkes.	10	16 and 19 Sept., 1910	From 27 Feb.	Pasture.
Major Barton, Towri, Maryvale.	8	26 Sept., 1910 ...	„ 4 Mar.	Forage.
A. Croft, Bellambi, Gulgong ...	10	21 „ 1910 ...	„ 8 „	Wheat.
F. Tout, Wambanumba, Young	12	12, 13 Oct., 1910 ...	„ 16 „	Pasture.
J. Lithgow, Wattle Grove, Gilgandra.	9	3, 4 January, 1911 ...	„ 27 „	Wheat.
P. Walkom, Spring Lawn, Blayney.	8	17, 18 October, 1911	Fed to cows from 1 Jan., 1911.	Hay.

Maize.

The varieties Yellow Dent and Cocke's Prolific were sown as being specially suitable for green fodder or silage. At Young a variety, Clarence Wonder, with a local reputation, and at Gulgong a local variety, Kennedy, were sown in competition with the two former. At the other four places no local variety of sufficient repute was obtainable.

Yellow Dent proved superior in every instance, giving the highest yield of fodder, and also the greatest number of cobs. It was so promising that at three of the plots a portion was left for grain. At Gulgong it shows special promise for grain. The greater quantity of stalks and cobs yielded by this variety was largely due to the fact that it tasselled later than the other varieties sown, and received rain at tasselling time; whereas the others at four of the plots were at the stage of tasselling and cob formation when the weather was dry.

My observations incline me to the opinion that in the Western District if farmers will sow the main crop of maize so that it will tassel when they can mostly depend on good rains, January and February, they will in most cases succeed in getting a payable yield of grain. It is advisable, however, to make continuous sowings from September to December, when there is every chance of rain falling to suit some portion of the crop.

As a fodder-producer, Yellow Dent can be safely recommended for Western conditions, sown from September to January.

Cocke's Prolific did not, in any instance, equal Yellow Dent, and on the results obtained under different conditions of soil and climate I cannot recommend it. It is a white maize, matures earlier than Yellow Dent, and produces a shorter growth.

Kennedy Corn.—This maize has a Gulgong reputation as a good grain-producer, but Mr. Croft, who championed this variety, and farmers who visited the experiment plot at Gulgong, were convinced that it had no standing as a grain-producer compared with Funk's Yellow Dent, Iowa Silvermine or Early Leaming, according to the results obtained this season.

As a maize for silage, I believe it has a future. The characteristics of this variety are tall-growing thin stems, carrying one or at most two small and somewhat long cobs, which are erect on the stems. It yielded as well as Yellow Dent for fodder, and is specially suited to farmers who only possess a chaff-cutter, which has to serve the purpose of cutting both wheat and oats for chaff, and maize or sorghum for silage. With most varieties of maize there is a considerable amount of trouble chaffing them, due to the dumpy cobs choking the jaws of the chaff-cutter. With a variety such as Kennedy, this trouble would be minimised. The grain is long, light red, and comparatively small.

Clarence Wonder.—This variety did not equal Yellow Dent. Mr. F. Tout was satisfied that Yellow Dent made a better showing. It has proved superior to Cocke's Prolific.

Yellow Dent Maize on Forage Plot at Young.

Sorghums.

There is no doubt about the suitability of the sorghum family for the hot and somewhat dry western conditions. This is only bearing out the experience of other countries, and when it is remembered that sorghums grow in dry parts of Egypt and Arabia, there is every prospect that, when the varieties that are suitable to such arid localities are tested in our western area, we shall be able to demonstrate their value much further west than our present plots.

Cowpeas and Soy Beans.

The experience of last year demonstrated that the *Black Cowpea* was most suited to the Western districts, compared with *Clay* and *White*. It was

specially noticeable in the two years' trials that cowpeas excelled on sandy loams, but on the medium to clay loams and certain granitic and basaltic soils, they do not make anything like the growth, although the forage produced pays for the outlay.

To test the value of another leguminous crop on both classes of soil, soy beans were sown this season. The variety sown was not suitable in any instance. The seed was sown shallow, following the American practice, and at each plot germinated well. For the first month it exceeded the cowpeas in the adjoining plot in growth. During the second month the soy beans were affected by bean-rust and devoured by leaf-rolling insects. The grasshoppers also preferred them to the other crops, and completed their destruction. I had hopes that the soy bean would excel, because the crop can be successfully harvested with a reaper and binder, whereas cowpeas are a crop essentially to be fed off. Further trials will be conducted during the coming season.

Amount of Seed per acre and Depth of Sowing.

Crop.	Amount of Seed per acre.	Depth of Sowing.
	lb.	inches.
Maize	8 to 18	2½ to 3
Sorghum	4½ to 5½	1½ to 2
Cowpeas	9 to 15	2 to 2½
Soy beans	10 to 15	1 to 1½

The above quantities of seed of the various crops were sown at five plots. At Gilgandra, where a January sowing was made, the quantity was increased owing to the seed being somewhat damaged by weevil.

The smallest sowing was done satisfactorily with a wheat-drill, and produced sufficient plants, and was sufficiently well distributed, to only require partial thinning in the maize section, when grown for grain. All the plots sown in September were thinned by the frost of 12th October.

The grain was sown in drills approximately 3 feet to 3 feet 6 inches apart. These spaces are sufficient for cultivation purposes, and I do not think much greater widths advisable on present experience, for the following reasons:—

(1.) Increased width means increased exposure to dry winds and to the fierce heat of the summer sun.

(2.) Greater widths increase the tendency of the plants to surface rooting and to suckering.

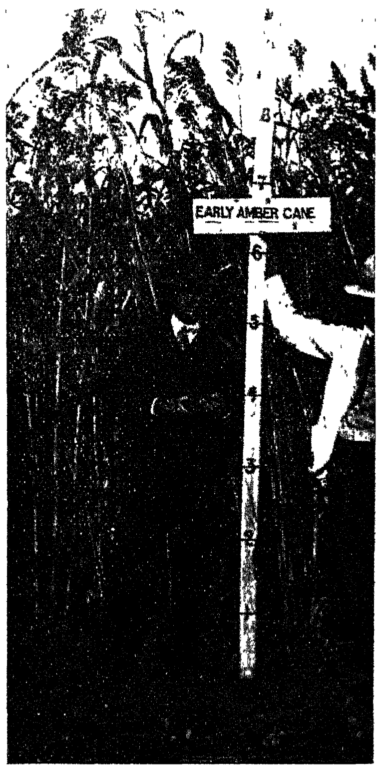
(3.) A greater cost is incurred for cultivation, and more land is occupied to produce a given quantity.

Cultivation.

The land was twice ploughed from winter to sowing time, and kept free from weeds and from surface setting by spring-tooth and disc cultivators. Each of the plots was harrowed across the drills after the crop was up; and a cultivator was used later between the rows to destroy young weed-growth,

and to keep the surface soil open. The objects were, first, to minimize evaporation, and second, to retain any rain that might fall. In the summer months, in the west, a quantity of rain may fall in a short space of time, sufficient to run if the surface is too fine or compact; hence the necessity for keeping the surface soil loose.

Maize on Gulgong Forage Plot.
Iowa Silvermine on left; Yellow Dent on right.



Early Amber Cane Sorghum, Gulgong Forage Plot.

Yields of Fodder.

The table of fodder yields shows the best results at Gulgong and Young. These two plots were favoured with a better rainfall than the others; but without detracting in any way from the credit due to the farmers on the other plots for their attention to details, Mr. A. Croft, of Gulgong, and Mr. F. Tout, of Young, were very thorough (within commercial limits) in carrying out the details of cultivation, &c., set out for the successful working of their respective plots.

At Gilgandra, Maryvale, and Parkes the season was less favourable. At Parkes no rain of consequence fell from ploughing time in August till sowing

time, in the latter part of September; and, even then, it was not sufficient to soak in to any depth. At Gilgandra, the spring was exceptionally dry, and the seed-bed not being quite in order, a sowing in January was decided on. The Maryvale plot was conducted with the thoroughness usual on the Towri Estate.

At Blayney the test was not successful, due chiefly to the prevalence of sorrel and the depredations of rabbits. Mr. Pritchard Walkom ploughed and cultivated the soil well prior to seeding, and the seed was sown under good conditions, there being sufficient moisture to cause germination. The climatic conditions—cool and moist—favour the growth of sorrel on the tablelands.

The effect of sorrel on young maize is most damaging, as it causes discoloration and stunting. An attempt was made, shortly after the crop was up, to eradicate the young sorrel, by cultivation. Further, as the land had been in cultivation for years, its natural fertility had been reduced.

The crop was good in patches where an old shed or house had stood. The test not being comparative, Mr. Walkom was instructed to feed the plots to his cows. He expected to get sufficient return to pay him for the expense of sowing and the rental value of the land.

The yields at Maryvale and Parkes, although not equalling those of last year, are satisfactory, considering the dry period to tasselling and the fact that maize makes little growth after flowering is finished. I am satisfied that on the season's rainfall a later sowing of these two plots would have produced a much better yield of fodder and grain. It should be remembered that (1) by the method adopted 20 acres may be sown in one day by one man driving four horses in a 13 or 15-tube drill; (2) the cost of seed for each acre of maize is 9d.; sorghum, 1s. 6d.; and cowpeas, 1s. 6d.; (3) harvesting with a maize binder is easy and expeditious, and the cost of conserving in shallow pits is small. Under these conditions, 6 to 10 tons of fodder to the acre is a payable crop.

If we can strike the right time for sowing, so as to obtain the best growth before tasselling, a more dependable estimate may be made as to the amount of fodder that may be obtained under the western conditions of rainfall and heat.

Manurial Trial.

A manurial trial was made with both maize and sorghum. A complete fertiliser was used, containing—

6 cwt. dried blood,
4 cwt. bone-dust,
8 cwt. superphosphate, and
2 cwt. sulphate of potash,

to the ton of manure. This was applied at the rate of 1 cwt. per acre. It was drilled in with 13 to 15-tube drills. One-third of the manure was delivered in the drill in which the seed was sown, and two-thirds in the drills adjoining on either side. Thus nine tubes fed manure, whereas seed was only delivered by three of them.

The table of yields shows the increase due to manure. Considering the outlay, the result is not satisfactory, and this year's trial, studied in conjunction with that of last year, indicates that the application of manure in the spring months, when the Western rainfall is light, hastens the plants to

Millets on Gilgandra Forage Plot.

Finishing-off Pit Silo, Gulgong Forage Plots.

maturity without a marked increase in growth. I would suggest smaller quantities when applied in the spring or summer. It would be preferable to increase the fertility of the soil by applying fertilisers in the autumn to a crop which should be fed-off in the winter, and the land prepared for maize in the early spring.

Sowing Cowpeas with Maize.

At each plot sections were sown with Yellow Dent maize mixed with cowpeas. In no instance did the yield of fodder equal the Yellow Dent alone. As this does not bear out previous experiments, a little more light on the subject seems necessary.

As a rule, it was found that the drill sowed the mixture a little more thickly than the maize alone. As the cowpeas were largely destroyed by frost, it almost resolved itself into a test of two plots of maize; but as one was sown more thinly than the other it can hardly be considered a trial.

Sowing Cowpeas with Sorghum.

As with last year's trial, cowpeas made a better growth sown with sorghum than with maize. Further, the runners (vines) appear to have an antipathy to maize, and do not twine around the stalks in the same manner as they do with sorghum. With Amber Cane alone and Amber Cane and cowpeas mixed, the yields of fodder on two plots were about the same; and on the other two, where weights were taken, the mixture gave a greater return. In the two instances, where approximately equal yields were obtained, the cowpeas were almost destroyed by late frosts; and as there were ample plants of Amber Cane without the cowpeas, it was to be expected that the yields would be about the same. Amber Cane alone was sown at the rate of 5 lb. seed per acre, whereas with the mixture the seed to the acre was:—Amber Cane, 4 to 5 lb.; cowpeas, 8 lb.

I cannot too strongly recommend the mixture of Early Amber Cane and cowpeas to farmers for fodder. In addition to the mixture being a better balanced food for stock, the improvement to the fertility and healthy condition of the soil caused by the cowpeas, would alone justify their inclusion.

Millets.

Two varieties, *Hungarian* and *Manchurian*, were on trial this season at Parkes and Gilgandra. They were sown at the same time as the maize and sorghum.

At Parkes, grasshoppers almost destroyed the more tender variety, Hungarian, and thinned out the Manchurian. This latter variety, however, yielded 18 cwt. to the acre of semi-mature fodder, in rows 3 feet apart. It grew to 3 feet 6 inches high, and its showing under adverse conditions impressed local farmers.

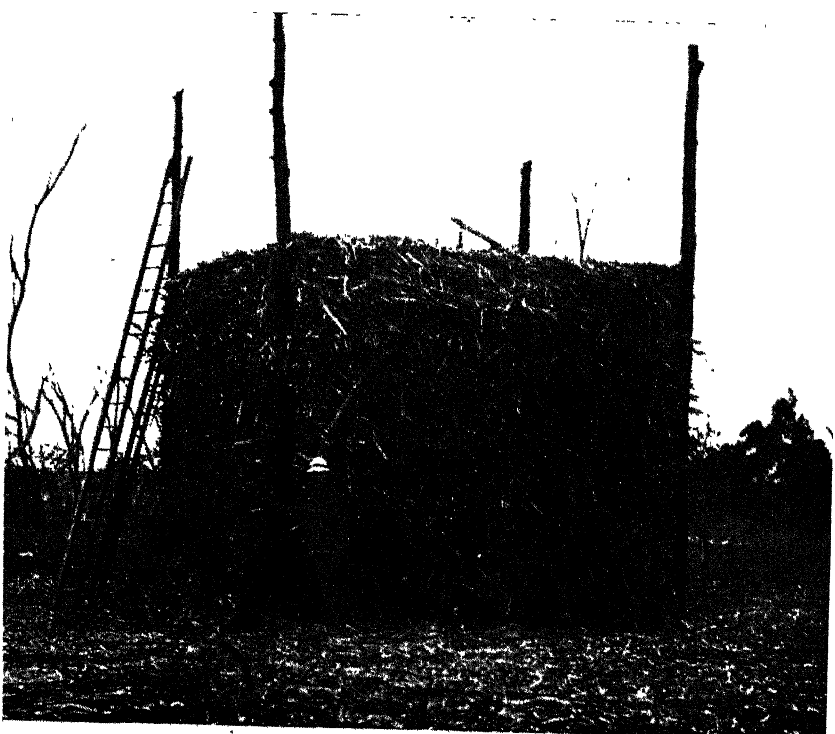
At Gilgandra, Manchurian also excelled over Hungarian.

At Gulgong a spring sowing was not made of millet, but a sowing was made in the wheat stubble without manure. The Hungarian seed was sown with a disc wheat-drill in alternate tubes, and was cut for hay on 17th March. No preparation of the land was made, the seed being sown 1 to 1½ inches deep. It germinated after the first shower of rain. It made a good showing, and outgrew the various weeds that usually appear in stubble when rains occur in late summer. The bulk of it was over 3 feet high. It yielded, with other grasses, 1 ton to the acre.

Sorghums on Gilgandra Forage Plot.

Filling Pit Silo at Young Forage Plot.

Silage Stack in course of erection, Parkes Forage Plot.



Silage Stack at Parkes Forage Plot.

SUMMER CROPS, WESTERN DISTRICT, 1910–1911. Yield of Forage per acre when cut for Silage.

Crop.	Gulgong.	Young.	Maryvale.	Parkes	Gilgandra.	Blayney.	No. of Trials	Average yield per acre
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.			t. c. q.
Yellow Dent Maize	15 10	15 0	4 13	5 1	7 0	Yield not estimated. Fed to Cows	5	9 8 3
Yellow Dent and Cowpeas	14 10	14 0	....	3 11	6 10		4	9 12 3
Yellow Dent, no manure	13 0	13 10	....	4 7	6 1		4	9 4 2
Cocke's Prolific Maize	9 0	12 0	3 17	3 6	6 4		5	6 17 1
Early Amber Cane Sorghum	19 0	16 0	5 13	6 18	6 0		5	10 14 1
Early Amber Cane and Cowpeas	18 18	15 10	....	7 10	7 8		4	12 6 2
Planter's Friend Sorghum	24 0	17 0	6 15	6 8	4 5		4	14 12 0
Planter's Friend, no manure	20 0	15 0	....	4 0	3 15		4	10 13 3
Cowpeas	4 10	4 10	2 10	2 10	3 0		5	3 8 0
Farmer's Variety	Kennedy, 15½ tons.	Clarence Wonder, 13 tons.	.. ..	.. ..	... .		2	14 5 0

The weights were estimated when the fodder crops were on the mature side, that is the grain was well formed in cobs, and had its dented characteristics, and the leaves had partly lost green colour. The sorghums had seed well filled and hard. As far as the maize is concerned, better yields would have been registered had they been weighed earlier.

Butter Factory Plans.

M. A. O'CALLAGHAN.

THE plans published herewith were, in the first instance, drafted by Mr. Dairy-Instructor C. Pedersen, after having gone into details with me. Further drawings were prepared by the Government Architect, and they are now published for the guidance of factory managers and factory directors.

It is impossible to fix on one plan which will be suitable to all conditions, because each plan must vary somewhat according to the nature of the site, and other circumstances. Generally speaking, however, the plans given herewith should be a useful basis on which to construct. It may be found advisable to slightly alter the arrangement of the working and packing room, and possibly the churning-room, to suit some conditions.

At the present time there is a considerable movement in the direction of improving the construction of our butter factories, and before another year factory directors will probably find that many of the old buildings will have to be reconstructed, in order to be brought up to the requirements of modern manufacture.

Explanation of Ground Plan.

A. CREAM-RECEIVING PLATFORM.
1. Tank into which the cream is tipped after having been weighed, sampled, and graded.
2. Cream pump.
3. Cream-cooler and stand.
4. Automatic can-steamer.
5. Wash-ups.
6. Automatic can-steamer.
7. Racks for draining cream-cans after cleaning and before being returned.
8. Test room.
9. Landing and steps.

B. CREAM ROOM.
1, 2, 3, 4. Cream vats.
5. Landing and steps.

C. CHURN ROOM.
1, 2, 3. Six posts for three churns.

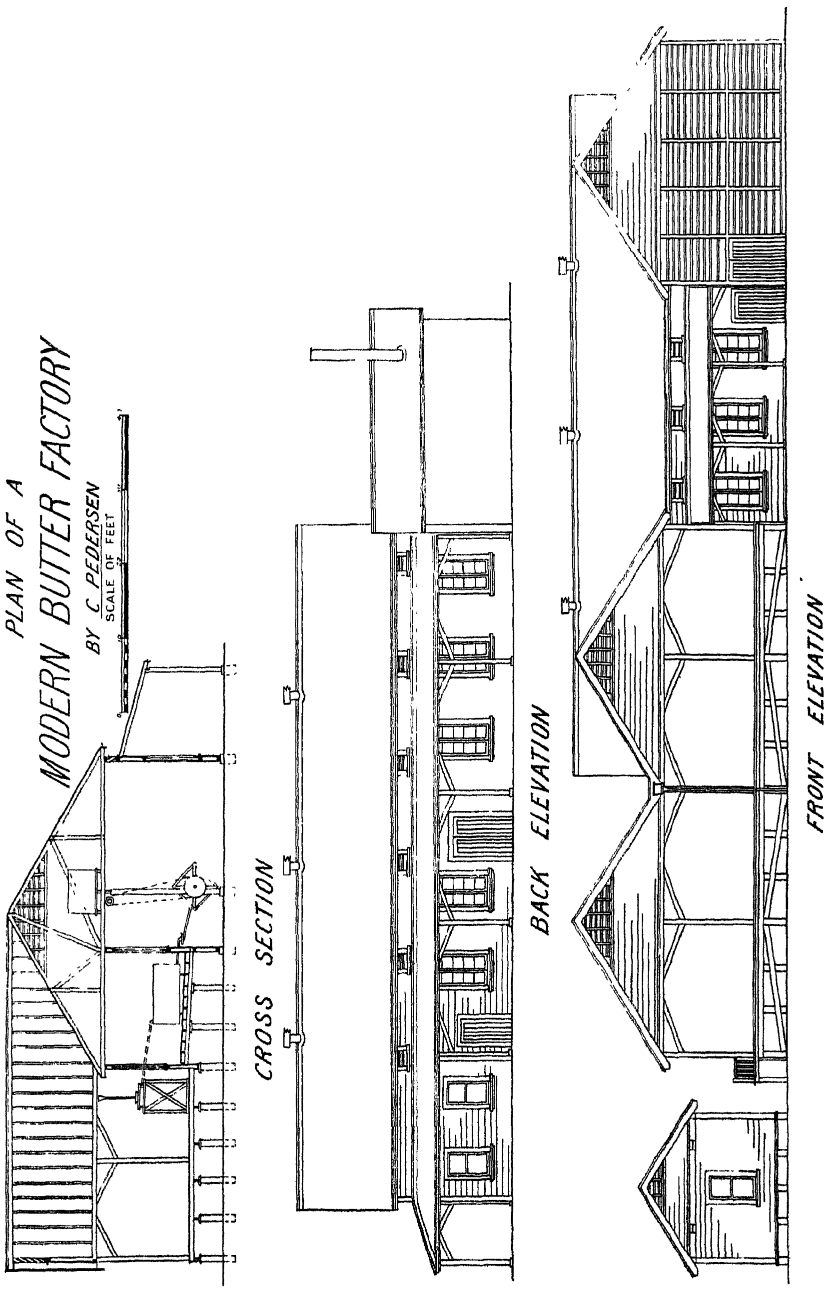
D. WORKING AND PACKING ROOM.
1. Salt table.
2, 3. Butter-workers.
4. Packer.
5. Table.
6, 6. Cool rooms.

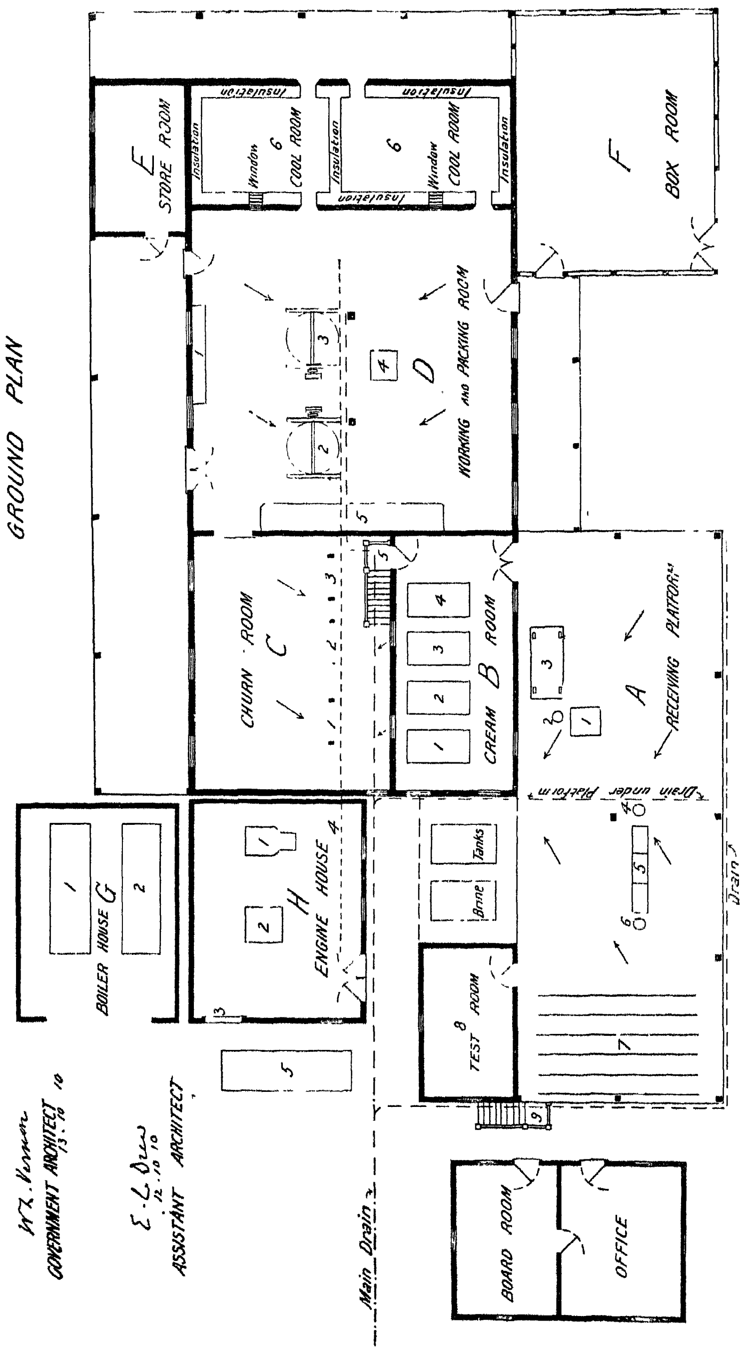
E. STORE ROOM, for salt, etc.

F. BOX ROOM.

G. BOILER HOUSE.

H. ENGINE HOUSE.
1. Steam engine.
2. Compressor.
3. Sliding doors.
4. Main driving, shown by dotted lines.
5. Condenser.


PLAN OF A
MODERN BUTTER FACTORY
BY C PEDERSEN
SCALE OF FEET
CROSS SECTION
BACK ELEVATION
FRONT ELEVATION



Plan of a Modern Butter Factory.

The Financial Aspect of Cheesemaking.

In March, 1911, *Gazette,* under the heading "Cheese Shipped to London from Hawkesbury Agricultural College," Mr. J. G. McMillan, Dairy Instructor at the Hawkesbury Agricultural College (now Manager of the Wollongbar Experiment Farm), gave some estimates of the cost of manufacture of cheese, and the prices which could be paid to suppliers for milk when cheese is realising 56s. per cwt. in London and Sydney respectively. As the figures have been questioned, Mr. McMillan gives the following details, upon which they are based :—

Statement of one week's transactions in the Manufacture of Cheese for Export at a Factory dealing with 1,000 gallons of Milk per day.

Dr.	£	s.	d.
To 7,000 gallons milk, at 4¼d. per gallon	123	19	2
Rennet (4 oz. per 100 gallons milk), 1¾ gallons, at 13s....	1	2	9
Colour (2 oz. ,, ,,), ⅞ gallons, at 12s. ...	0	10	6
Bandaging, 18 inches per cheese, 44 yards, at 3d. ...	0	11	0
Circles, 2 per cheese, 176 at 30s. per 1,000	0	5	3
Salt, 170 lb. at 4s. 6d. per cwt.	0	7	0
Sundries (soap, brushes, acid, &c.), and repairs... ...	1	0	0
Crates, 44 at 2s. each	4	8	0
Fuel (approximately 7s. 6d. per day)	2	12	6
Wages: Manager, £3; assistant, 42s.; youth, 25s. ...	6	7	0
Cartage to railway	0	7	0
Freight to Sydney	1	7	9
Cartage to cool stores	0	6	0
Marine insurance, at 11s. 3d. per cent. on £173 5s. ...	0	19	9
Storage and delivery to steamer	1	1	5
Bills of lading	0	1	0
Freight, prepaid to London, on 6,930 lb., at ⅝d. per lb....	18	1	0
Landing, delivery, port dues, &c....	2	0	10
Commission, 2¼ per cent. on £173 5s.	3	18	0
Discount, 5 per cent. at two months	1	8	10
Depreciation on buildings—Capital value, £600—at 5 per cent. per annum—one week	0	11	6
Depreciation on plant, value £400, at 10 per cent.—one week	0	16	0
Dividend, at 5 per cent. per annum on £1,100 capital,—one week	1	1	2
Balance	0	1	7
	£173	5	0
Cr.			
By 6,930 lb. of cheese, at 56s. per cwt.	£173	5	0

The cost of manufacture may be summarised as follows:—

	£	s.	d.		d.	
Materials ...	3	16	6	or	0·133	per lb. cheese.
Crates ...	4	8	0	,,	0·152	,,
Fuel ...	2	12	6	,,	0·091	,,
Wages ...	6	7	0	,,	0·220	,,
Cartage and freight ...	1	14	9	,,	0·060	,,
Sydney charges ...	2	8	2	,,	0·083	,,
London charges ...	2	0	10	,,	0·071	,,
Steamer freight ...	18	1	0	,,	0·625	,,
Commission and discount ...	5	6	10	,,	0·185	,,
Depreciation... ...	1	7	6	,,	0·048	,,
Dividend ...	1	1	2	,,	0·037	,,
	£49	4	3		1·705	per lb. cheese.

This may be further summarised as follows:—

	d.
Cost of milk per lb. cheese ...	4·292
Cost of materials, manufacture, sale, &c. ...	1·705
Balance, 1s. 7d. ...	0·003
Per lb. selling price ...	6·000

STATEMENT OF ONE WEEK'S TRANSACTIONS IN THE MANUFACTURE OF CHEESE, FOR SALE LOCALLY, AT A FACTORY DEALING WITH 1,000 GALLONS OF MILK PER DAY.

Dr.	£	s.	d.
To 7,000 gallons of milk, at 5d. per gallon ...	145	16	8
Rennet, 1¾ gallons, at 13s. per gallon ...	1	2	9
Colour, 7-16th gallon, at 12s. per gallon...	0	5	3
Bandaging ...	0	12	6
Circles ...	0	10	6
Salt, 170 lb., at 4s. 6d. per cwt. ...	0	7	0
Sundries (brushes, soap, acid, repairs, &c.) ...	1	0	0
Fuel (including oil), approximately, 11s. per day ...	3	17	0
Wages: Manager, £3; assistant, 42s.; youth, 25s. ...	6	7	0
Cartage to railway ...	0	6	6
Railway freight ...	1	4	7
Commission, at 5 per cent....	8	13	3
Insurance ...	0	7	6
Depreciation on buildings, 5 per cent. on £600 ...	0	11	6
,, plant, 10 per cent. on £400 ...	0	16	0
Dividend on capital £1,200, at 5 per cent.—one week...	1	3	0
Balance ...	0	4	0
	£173	5	0
Cr.			
By 6,930 lb. of cheese, at 56s. per cwt. ...	£173	5	0

The cost of manufacture may be summarised as follows:—

	£	s.	d.		d.	
Materials ...	3	18	0	or	0·135	per lb. cheese.
Fuel ...	3	17	0	,,	0·134	,,
Wages ...	6	7	0	,,	0·220	,,
Cartage and rail ...	1	11	1	,,	0·054	,,
Commission and insurance ...	9	0	9	,,	0·313	,,
Depreciation... ...	1	7	6	,,	0·048	,,
Dividend ...	1	3	0	,,	0·040	,,
	£27	4	4		0·944	per lb. cheese.

This may be further summarised as follows :—

	d.
Cost of milk per lb. cheese	5·051
Cost of materials, manufacture, sale, &c.	0·944
Balance 4s., or	0·005
Per lb. selling price	6·000

The first consignment of cheese was made through the Agent-General, and no charges were made for selling, the discount being taken as the selling charge. In the second consignment, through a private firm, the charge for selling was $2\frac{1}{4}$ per cent., in addition to discount. The freight charged on the first consignment was $\frac{1}{2}$d. per lb., but on the second consignment, through another steamship company, $\frac{5}{8}$d. per lb. freight was charged. These two items raise the cost of production; but Mr. McMillan is confident that when cheese is exported, and realises 56s. per cwt., $4\frac{1}{4}$d. per gallon can be paid for milk, whereas when sold in Sydney at the same price, 5d. per gallon can be given to suppliers. Fuel, rail, freight, and cartage are varying items. If mechanical curd-stirrers are used in the factory, less labour is required. Crates are not included in local sales, as they are not absolutely necessary; and if adopted at all, they can be used several times.

Allowing for all varying local conditions, Mr. McMillan is convinced that the cost of making and selling should not exceed 1·75d. and 1d. to $1\frac{1}{8}$d. per lb. for export and local sales respectively.

In a newspaper report of Mr. McMillan's previous remarks it was stated that when making cheese entirely for export a refrigerator would be necessary. This was a typographical error, the word "not" being omitted.

The Peruvian Rain Tree.

"G. M.," Bellinger River, forwards a newspaper clipping, setting out that this tree collects 9 gallons of water per day, and that its condensing capacity is greatest when the rivers are lowest and the heat intense. It is added that a plot of ground, a kilometer square, planted with 10,000 trees, would give 30,000 gallons of water per day for irrigation purposes.

This is the same old yarn that we have been trying to knock on the head for a quarter of a century or more. The tree referred to is *Pithecolobium saman.* Its merits as a conserver of moisture in the air are grossly and ridiculously exaggerated. Moreover, it is a strictly tropical tree. For many years we have reared it in hot-houses in the Sydney Botanic Gardens; but although the attempt has been made during at least ten or twelve years, we have never been able to cause it to survive a single Sydney winter. It is, of course, quite possible that it might survive the winter in the Richmond or Tweed district, but I have no hesitation in recommending "G.M." not to spend money in attempting to acclimatise it on the Bellinger.—J. H. Maiden, Government Botanist.

The Branding of Young Calves

C. G. F. GRANT, Dairy Instructor, Wollongbar Experiment Farm.

THE branding of young calves at Wollongbar from time to time, brought out so forcibly the advantages of the "Tattoo Ear-marker," that perhaps a few words as to its application, &c., and a comparison with other known methods, may be of interest to farmers engaged in the dairying industry.

It is essential in the rearing of stock for stud purposes, that calves be given some distinguishing brand at birth, in order to guard against error and confusion when the time arrives to number them for the Stud-book. Of the many efforts that have been made to introduce a system that would be simple, lasting, and reliable, four are worthy of mention, viz.: the hot-iron brand, the liquid brand, the ear tag, and the tattoo ear-marker.

Fig. 1.—Branding a Calf with Tattoo Ear-marker.

The hot-iron brand, the most widely known system, though successful in its main objects, has many ill effects on the animal. Applied to the tender skin of a calf it too often results in blotching, and the blistering thus caused forms into horny excrescences, in many cases leading to cancerous growths. The brand also increases in size with the growth of the hide.

What is described as the liquid brand, consists of clipping the hair and then applying a patent liquid preparation by means of a wooden stamp. Of the cases under this treatment that have come under my notice, some have proved excellent, but in most instances I have found that with age and wear, the brands have become too indistinct to be easily decipherable.

The ear-tag system would seem, to a casual observer, to be efficient in every way, and to act as a trustworthy distinguishing brand; yet experience at this Farm has proved that it cannot be recommended as a method likely to ensure absolutely correct results. It has been proved time and again that, no matter how carefully inserted, the tag will not remain in the ear for more than twelve months. Either the hole enlarges, allowing the tag to be pulled out, or the tag tears out, leaving a disfigured ear.

The failing of the abovementioned systems brings us to the more modern tattoo ear-mark, which has been tested on this Farm during the last two years; the results being so satisfactory that it can be thoroughly recommended to breeders of sheep and cattle. The value of the tattoo lies in the fact that the calf may be branded as soon as it is taken from its mother, without detriment to its health or appearance. From Fig. 1 it will be seen that the machine is so constituted that the numbers or initials may be punched on the inside of the calf's ear.

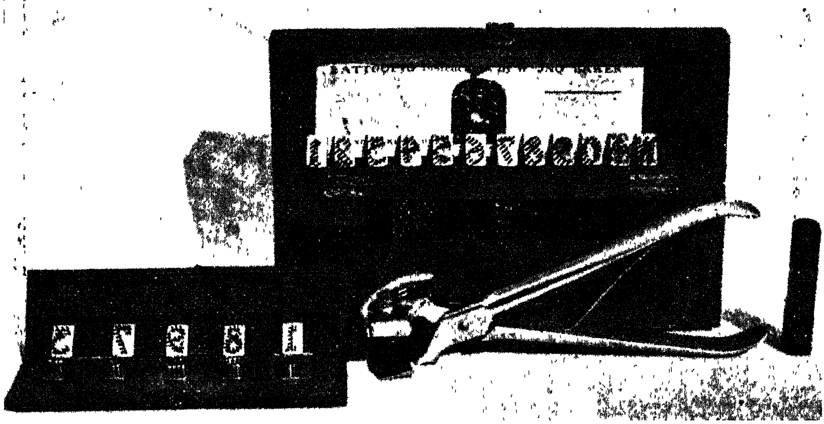


Fig. 2.—Tattoo Ear-marker and Accessories.

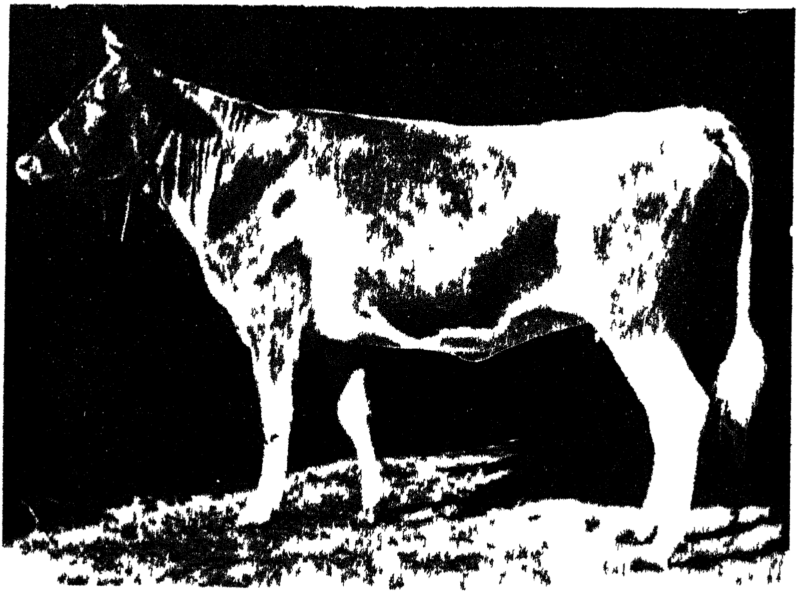
Preparatory to operating, the inside of the ear should be washed with turpentine or warm water, in order to remove any greasiness which would otherwise interfere with the process of tattooing. When the ear is pierced, blue Indian ink (procured in stick form) should be damped and rubbed well over the holes. In three or four days' time small blisters will appear on the skin, but must not be interfered with; these will disappear, leaving a clear distinct brand. With this method of numbering calves at birth, the calf may be allowed to grow to, say, nine months, when the hot-iron brand may be applied with most satisfactory results.

Another Importation of Guernsey Cattle.

M. A. O'CALLAGHAN.

Mr. J. Perry, who started farming at Nundorah, near Scone, on a portion of the old St. Albans Estate, has recently imported three young Guernsey females from the Island; and, in addition, is bringing a Guernsey bull of a great milking family from America—thereby showing unusual enterprise. The three females have recently been landed, and show undoubted quality.

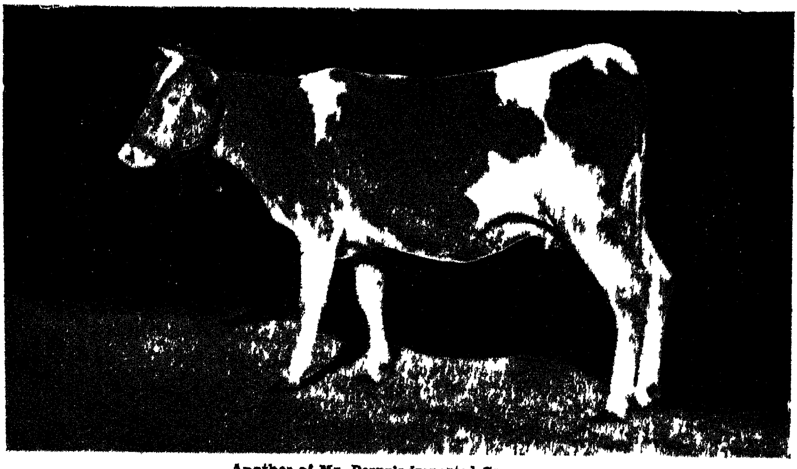
La Colomb is a very strongly constituted heifer, of a very active temperament, and has all the conformation of a high-class dairy beast. Viewed from behind, the udder formation is excellent, and there is a large quantity of



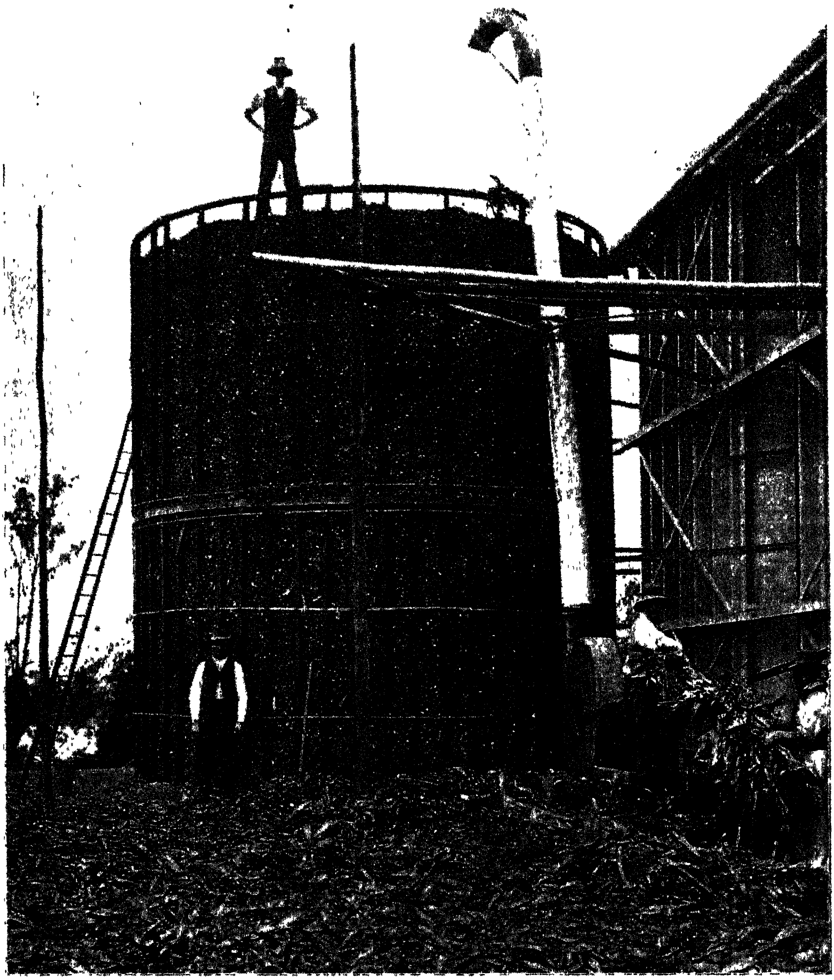
Mr. Perry's Imported Guernsey Heifer "La Colomb."

loose elastic skin, which will be available for a very full development of the udder when the animal calves.

The other heifer is further advanced in calf, and is showing a slight spring in the udder. She is a heifer of much quality, with a good middle-piece; and as she stands over a great deal of ground, is wide across the hips, and long from the hip to the pin-bone, she has all the characteristics of a good breeding animal. The third heifer, Mignonette, is really the pick of the three, but no photo. is available.



Another of Mr. Perry's Imported Guernseys.



The Chaff Stack Pole and Netting Silo (Patented).

Between the wooden or cement silo, which is expensive, but ensures a maximum percentage of palatable silage, and the open stack, which is cheap, but involves considerable waste of material, Mr. Sylvester Browne, of Singleton, has evolved and patented the silo shown in the accompanying illustration. While this method of conserving fodder is more expensive than the building of a stack, it is very much cheaper than erecting a concrete or even a frame silo. On the other hand, while it does not protect the forage

from the weather as effectively as a concrete structure, the fact that the material is chaffed and closely packed ensures less waste than occurs in an ordinary stack. It is an intermediate silo—intermediate in cost, and intermediate in efficiency.

The following particulars have been supplied by Mr. Browne, the patentee:—

This silo is designed for chaffed cornstalks, sorghums, or any green crops, without going to the expense of erecting cement, brick, or other costly buildings. The only materials used are either poles cut from the forest, and sunk about 1 foot in the ground, or sawn timber studs; and let-in plates, 6 inches by 2 inches, laid flat on the ground. The only inside lining used is ordinary 1½ inch wire rabbit netting, stapled on the poles or studs.

When building with sawn studs, it is as well to build in 10 feet sections as to height, with a circular wood cap to receive the lower and next 10 feet section studs, mortised into the cap. By this means the silo can be raised to any height in 10 feet sections, the storage capacity being regulated by the diameter.

The outward pressure of the silage is met by the wire-netting, which overlapping inside gives great strength; while outside are belly-bands, of common No. 10 fencing wire, quadrupled to give additional strength and enable a teamster's wooden switch to be used. As many belly-bands can be used as may be deemed necessary, but two to each 10 feet section are ample.

The roof is designed to lower inside by weights outside, on rollers. The silo here shown is built with sawn studs from the local mill, and the total material used to make the silo as it now stands, with about 90 tons of corn ensilage, was under £15. A roof taken from an American plan was afterwards put on at a cost of £6 15s., bringing the cost of the silo holding 90 tons chaffed corn silage up to about £21. A silo built on these lines to hold 250 tons of chaffed corn or other silage should not cost more than £40. The silage, when set, does not allow rain to get in at the sides; and in chaffing corn and blowing it in with an Ohio chaffcutter and blower the flag is carried to the sides of the netting, making a kind of papier-maché rainproof covering. The inside following roof prevents the rain from getting in at the top. The silage seen in the illustration had all the good cobs taken off and used for horse feed through the summer, whilst the silage was fed to stock.

Mr. George Valder, Chief Inspector of Agriculture, who visited Singleton to see this silo, reports as follows:—

An inspection of the silage in this silo, when it was being emptied, showed that there was a considerable loss from the air getting in at the sides. This loss was not nearly as great as that usually seen in a silage stack, but still there was a layer of from 6 inches to a foot on the outside which was quite bad, and in this respect it compares unfavorably with cement or wooden silos; but, on the other hand, it can be cheaply made, and there is no doubt it gives better results than the stack. The silage, other than the outside layer, was of excellent quality; in fact, just the same as if it had been made in a cement or wooden silo.

THE MODERN MILK PAIL.

MORE than one-half of the infection that milk receives during the milking process can be prevented by the use of a covered pail. A covered pail which is less than 12 inches high and is provided with an elliptical opening, 7 x 5 inches, is practically as convenient for milking as an ordinary pail. Such a cover can be placed upon an ordinary milk pail by any tinsmith at very little expense. Such a pail is inexpensive, durable, easily cleaned, and one of the most effective in keeping bacteria out of the milk.—BULLETIN 326, NEW YORK EXPERIMENT STATION.

Diseases of Animals.

Compiled by the Veterinary Officers of the Stock Branch, under the authority of
S. T. D. SYMONS, M.R.C.V.S., Chief Veterinary Officer.

No. 2.

DISEASES OF THE UDDER.

Simple Mammitis.

By this is meant those cases of inflammation of the udder which are not due to any particular organism, and in which the disease is not present in a contagious form. But, in the absence of veterinary advice, the safest plan is undoubtedly to treat all cases as though they might be contagious, unless the cause is an obvious external wound, or something equally manifest. In any dairy herd, cases of mammitis may be expected at any time, and the presence of micro-organisms is certainly an important factor in causing them ; but there are many other causes which, by weakening the resisting power of the animal, or exposing a delicate surface to infection, predispose to the disease, and afford the various micro-organisms always present an opportunity to attack the gland. Like all other types of the disease, this may be seen in cows recently calved, or at any time during the subsequent period of lactation, but not in dry cows, except in the form of wounds and bruises.

The most simple form of inflammation is that due to a wound or bruise more or less severe. This may be caused in many ways, such as horning, the bite of a dog, treading, scratches, tears on wire or stakes, or blows. A wound only involving the skin requires practically no treatment beyond washing with a little weak disinfectant; but if deeper, and exposing the gland, it should be attended to by thorough washing with 2 per cent. lysol and 1 per cent. carbolic acid, or other suitable disinfectant—not kerosene or Venice turpentine—and stitching with a little silk or thread, and keeping clean until healed. Bruises should be treated by fomenting with warm water, washing with disinfectant if the skin is at all broken, and the application of carbolised oil—that is, carbolic acid 1 part, oil 40 parts—over the bruised portion.

A more extended mammitis is often due to "overstocking," bad milking, or sudden and excessive cold. When affected, the udder, or those quarters of it attacked, are hard, red, and painful, the cow often walks with a straggling gait, and the milk is changed in a varying degree to a yellowish fluid, which later may become thick and contain clots. The animal may be somewhat feverish and lose her appetite. The udder gradually becomes larger and may burst if neglected, and discharge pus. If noticed early, the udder should be thoroughly fomented with hot water, and rubbed gently with carbolised oil or soap linament. The cow should be dosed with Epsom salts (*Mag. sulph.*), 10 to 16 ounces, according to the size, and an ounce or two of

ginger, and milked out as often as possible. If it is neglected, and commences to discharge pus, the treatment given below for contagious mammitis must be adopted.

"Overstocking" is the term given to allowing a cow's udder to become over-distended with milk until the milk is forced out through the teat. Cows in such a state may often be seen at sale-yards, the idea being to make buyers imagine the cow's udder to be larger than it really is. This practice is not only extremely brutal and unnecessary, but in many cases gives rise to an attack of mammitis owing to its deleterious action in weakening the tissues.

In some cases a chronic mammitis will follow the original attack. The quarter will become hard and small, and cease to secrete milk. The flow may return after next calving, but more often will not, and once permanently ceased it is impossible to artificially induce it.

Contagious Mammitis.

In an article published in the *Agricultural Gazette* for May, 1909, by the veterinary officers of the Stock Branch, it was stated that this had not so far caused serious trouble in this State, but that it must be regarded as having a firm hold in certain districts. Information collected by the veterinary officers since that time shows that the disease is more widespread than was at that time supposed.

It is essentially a disease of dairy cattle, and is more or less prevalent in all countries in which dairying has been carried on extensively for any length of time, but nowhere does it appear to have occasioned such serious loss as in New Zealand. Since at present we have no power of controlling this disease. it is likely to continue to spread, and there appears to be no reason to doubt that, if not checked, it may become a more serious obstacle to the dairy-farmer than contagious abortion has been in the past.

The disease is bacterial, and is the result of the introduction of various disease-producing organisms into the teat duct and sinuses of the cow's udder. In the majority of cases this organism is a minute circular germ known as a Streptococcus, but other organisms are quite capable of setting up the disease, the symptoms of which appear to vary according to the organism involved.

In the most acute type of case, which is fortunately not commonly found, a cow which was apparently in good health when last milked will be brought into the yard badly affected; the udder hot, tense, hard, and painful; the milk changed completely into a clear brownish-yellow fluid; the cow off her feed, shivering, with a staring coat, high temperature, often constipated, but sometimes suffering from an offensive diarrhœa; the breathing is quickened, and the eye dull. The cow gradually becomes worse, goes down and cannot be got up, and may die in forty-eight hours. Should she live longer, the general symptoms become milder, the discharge gradually becomes pus-like, and she may linger for some days. In cases in which the acute attack is recovered from, she may regain her general health, but the udder remains affected with a suppurating mammitis which may gradually invade the other quarters, recovery from which is practically impossible.

Beyond a dose of magnesium sulphate 1 lb., and ammonium carbonate 2 oz., followed by doses of ammonium carbonate, 2 oz. every four hours, and injection of the udder as described below, but little can be done by the farmer; so that, whenever possible, veterinary assistance should be obtained at once.

The more common form of the disease, usually due to Streptococci, is far less acute, and practically never fatal. Often but little general disturbance is shown, and very little change in the udder. There is usually a diminution of milk yield, the teat duct may feel a little thickened, and the quarter affected slightly swollen and hard, without, however, any pain, heat, or redness. The quality of the milk very often appears unchanged, except for the first quantity drawn away, which may be slightly yellowish. In other cases, rather more acute, the milk becomes thick and yellowish, and resembles pus. If examined under a microscope it is seen to contain numbers of pus cells and Streptococci.

If neglected, the disease becomes chronic, and often one or more small hard nodules will be found at the base of the teat or in its upper part. These vary from the size of a pea to a walnut, and are known as "pea" or "wart" in the teat. Frequently cows which appeared all right when dried off and turned out come back into the herd with a blind teat or one of these nodules, the reason being that she was infected when turned out, and the disease has since developed.

Treatment cannot be said to be very reliable, though this Department has, after trying several other methods with very poor results, been successful with the following:—As soon as a case is noticed the cow is given a dose of Epsom salts (10 to 16 ounces, according to size), the udder thoroughly fomented, and the affected quarter injected with a quarter of a pint of 4 per cent. boracic acid solution. This is made roughly by dissolving an ounce of boracic acid in a pint and a quarter of water and boiling it till dissolved, and is injected by means of an enema syringe, having a teat syphon fixed in place of the nozzle. An even better mixture, made and used in the same way, is, chinosol 5 grains, boracic acid 6 drachms, and water 1 pint. This treatment is continued twice a day for a week, unless the milk appears fairly normal before that time, when the treatment should be discontinued. To obtain successful results, cases must be treated in the very first stage. Care must be taken to boil the teat syphon before and after using. The quarter should be stripped before injection, the fluid left in for about ten minutes, the udder gently massaged, and the fluid withdrawn.

When the milk again appears normal, the cow had best be dried off for the season, as it is impossible to tell, without microscopical examination, whether the quarter is wholly free from disease. In chronic cases the best treatment is to fatten for the butcher.

In this disease, as in so many others, such as contagious abortion, the only reliable treatment is prevention. When a farmer finds that he has contagious mammitis in his milking herd he should at once isolate—that is, put in a separate paddock if possible, and certainly milk in a special bail set apart—all cows affected; he should certainly examine the udders of the other cows,

and any which he finds with nodules or thickening of the teat should either be turned out with a calf, fattened for the butcher, or put with the isolated cows. These cows should be milked after the regular herd, and the milk boiled and fed to the pigs; the milker should wash his hands thoroughly in a 2 per cent. solution of lysol, kreso, or other disinfectant after milking each one, and the injection treatment should be carried out.

The bails and shed should be given a thorough disinfection with carbolic, and the woodwork limewashed, this being repeated every month. In the case of a really severe outbreak, it may be found necessary to disinfect the udders of every cow after milking, and to make the milkers wash their hands in disinfectant after milking each cow, care being used that the disinfectant is not strong enough to taint the milk. The disease is usually spread from cow to cow by dirty milkers' hands and dirty milking machine cups; but though this is the most common means of infection, it must not be regarded as the only one, for dirty and infected bails may spread it, and in some cases it seems impossible to altogether exclude infected pasture from the sources of danger. By these varied means the disease spreads not only from cow to cow, but from one quarter to the other; and when cows suffering from contagious mammitis are sold into other herds, these in turn become affected.

To prevent it spreading from herd to herd, cows should not be brought straight into the milking herd, unless it is known that they come from a clean herd, but kept apart and examined thoroughly. The advisability of quarantining new cows brought into a herd from unknown sources cannot be too strongly impressed, although at the present time it is very rarely carried out. It is ridiculous to say that it is much trouble, merely meaning at the outside the erection of a little fencing and provision of a temporary bail, with the exercise of some care in milking; while in districts in which contagious abortion, contagious mammitis, pleuro-pneumonia, tuberculosis, and other diseases are present, this may be the means of saving a farmer the price of many cows.

In cases in which a farmer suspects contagious mammitis to be present in his herd, he should, when possible, call in a qualified veterinary surgeon to determine the question for him and advise; and in districts in which no qualified veterinarian is obtainable, a sample of milk from the affected quarter should be taken in a sterilised bottle (one that has been boiled), corked and sealed, and forwarded to this Department for examination.

Farmers are often inclined to consider contagious mammitis of little consequence because the individual cows appear so slightly affected; but if they will consider that in some outbreaks half the cows become affected, and most of those lose one or more quarters; that it is often very fatal; and that once given a lodgment in the herd, it may take months and years to eradicate it; they will, perhaps, consider the advisability of "prevention."

There is some hope that before long a method of inoculation will have been devised, by means of which not only many cases will be cured, but cows may to some extent be prevented from contracting the disease. The Veterinary Branch, in conjunction with the Bureau of Microbiology, is at present experimenting in this direction.

Tubercular Mammitis.

Cases of tuberculosis of the udder are not often seen unless the animal is also affected in other organs as well; but sometimes the first noticeable symptom of tuberculosis occurs in the udder, or in the mammary lymphatic glands (kernels) found just above the udder in front and behind. If these become hard and round the case is very suspicious, while tuberculosis of the udder may either show a firm, painless swelling, or a number of irregular, hard knobs. The milk secretion is not at first changed, but later becomes thin and bluish, in the last stages becoming clotted. Any case in which there is a hard, gradually-increasing lump in the udder must be regarded as suspicious, and the farmer should look for other symptoms of tuberculosis, such as a cough or swelling of the throat glands. That a cow suffering in this way is a great source of danger not only to calves and pigs, but to human beings—and especially children who may drink the milk—must be obvious to everyone, as her milk contains large numbers of tubercle bacilli which may infect animals and men drinking it.

There is only one proper course for a farmer having such a cow in his herd to pursue, and that is to have her examined by a qualified veterinary surgeon, or, failing that, to bring her under the notice of the Stock Inspector or Dairy Inspector at the first opportunity, when the officer, if necessary, may test the cow or forward a sample of milk to this Department for examination. It is a distinctly short-sighted policy on the part of the farmer, quite apart from the danger to which he exposes human beings who may use the milk from such a cow, to subject his calves and pigs to infection with tuberculosis by keeping these cows; whilst the practice of using cows with defective udders, which may be tubercular, for raising calves cannot be too strongly condemned.

Actinomycotic Mammitis.

Mammitis, due to invasion of the udder by the *actinomyces bovis*, may be found either in the form of hard, round nodules or as a diffuse inflammation and hardening. Without professional assistance it is not likely to be diagnosed, but the fact that it may occur is a further reason for the necessity of bringing cows with diseased udders under the notice of a veterinary surgeon or, failing that, of a Stock or Dairy Inspector.

Sore Teats.

As a rule, sore teats are due to dirty or careless milking, wounds, or chapping from colds and winds. The safest and best application is probably carbolised oil—that is, 1 part of carbolic acid and 40 parts of oil—but any suitable disinfectant mixed with lard or vaseline, to make an ointment, will do. The common habit of rubbing them with cow-dung is not only filthy and disgusting, but dangerous. The udder should be washed with warm water and a little disinfectant before milking, and the oil or ointment applied regularly, directly milking is completed.

Concrete for the North Coast.

The Hon. Sir Thomas T. Ewing recently forwarded to the Department of Agriculture a sample of creek gravel from Burringbar, Tweed River, for an opinion as to whether it was suitable for use in making reinforced concrete for buildings, &c. The following report on the sample was furnished by Mr. A. Brooks, Works Overseer of the Department:—

> The sample of gravel received from Sir T. Ewing, Burringbar, is perfectly suitable for concrete work. For building cottages it would be improved by the addition of one part sand to six parts of gravel as per sample. From the correspondence attached, it would appear that it is desired to know whether buildings can be more cheaply erected with concrete than with timber. Taking the probable cost of materials to be, sand and gravel at 3s. per cubic yard, and cement at 6s. per bag, the probable cost of concrete *in situ*, allowing for current rates for labour, and all fixing of moulds, would be 30s. per cubic yard.
>
> An ordinary four rooms and kitchen cottage, on level ground, would require not less than 66 cubic yards of concrete, with three bags of cement to each cubic yard; so that the cost of the walls may be put down at £100. Add to this about 400 yards of 1-coat plastering, for outside and inside, which will cost another £20, making the total of the finished walls £120. This would just equal the cost of timber walls, lined inside, and painted three coats, timber costing 17s. 6d. per 100 feet super. Cottages may be built with 9-inch cavity external and 3-inch solid internal walls, the upper 9 inches of the outer walls being made solid to take wall-plates. Two rows of wire as reinforcement should be laid under and over all window and door openings continuously round the building, while an additional two rods of ½-inch round iron should be placed over all openings, laying 9 inches on each side. In estimating this, it should be noted that no charge is made for the necessary centring and moulds to take the concrete, as the total cost of this plant would be spread over all the work to be done.
>
> Wherever gravel and sand similar to the sample submitted is easily obtained, the erection of all farm buildings, including silos, should be done in concrete.

This information should be valuable to North Coast residents where similar gravel is available in quantity. Once it is clearly established that in a given locality concrete is cheaper than wood, it should certainly not only replace timber in the construction of buildings, but should be used for silos, troughs, fence-posts, and a number of other purposes for which wood is usually employed. Concrete is more durable, cleaner, cooler, and in every way more suitable for our conditions.

Hastening the Growth of Kurrajongs.

One of the great drawbacks to the planting of this valuable tree is the slow growth that it makes. Anything which tends to hasten its development should lead to much more extensive cultivation.

Mr. W. Baird, of Dubbo, informed me that the large kurrajong on the Dripstone railway station was first planted in sand, enclosed in a piece of bamboo 18 inches long. This tree is now as big as trees planted in the usual way which are five years older. The station-master explained that by this method of planting, the root grew downwards, without throwing out many laterals, until it reached the soil below the bamboo, thus making a large root growth in a short time.—Mark H. Reynolds, Inspector of Agriculture.

The Draught Horse

Its Breeding from an Australian Farmer's Standpoint.

FRANK S. STENING, Little Plain.*

THE keen demand that has been and still is existing for draught horses of various classes has been the means of inducing farmers and graziers to devote considerable attention to breeding these animals as a source of revenue, so as to meet the claims of an almost insatiable market that prevails at the present time. One must view with a certain amount of concern, however, the general methods employed, as the present conditions of the market are not as a rule conducive to improving the different classes of draught stock; in fact, many farmers and graziers have resorted to the degrading practice of breeding any kind of inferior mares to the same class of stallion. This is having a very damaging effect on an important branch of the farming industry. The Scriptural adage, "Whatsoever a man soweth that shall he also reap," will soon become manifest in the resultant offspring where these bad practices are pursued.

It is at such a time as this that a note of warning is advisable, in order to arouse those breeders who have fallen into such serious mistakes to mend their ways, so that they, as well as the country in general, may reap the great and lasting benefit to be derived from breeding the draught horse on proper and approved lines.

Breeding of the Draught Horse.

Although there are three distinct classes of draught horses, light, medium, and heavy, the methods of breeding them are practically identical. Fortunately, we have three distinct British breeds that belong to these classes, viz.—the Suffolk Punch, the Clydesdale, and the Shire, which materially assists the Australian farmer to breed to any of the desired classes that he may require for his own use, or for the open market. It is advisable for the farmer first to study his own requirements and breed accordingly, and when he has fulfilled these, he may then turn his attention to the prevailing demands of the market.

Personally, I am an advocate of breeding on pure-bred lines—that is, mating a pure-bred mare of a certain breed to a pure-bred sire of the same breed; but this is at present outside the bounds of practicability with most Australian farmers on account of the comparative shortage of pure-bred mares and the extremely high values they realise. It is, therefore, necessary to adopt the next-to-best course in order that improvement may be made, and that is the mating of a pure-bred sire to a grade mare of the same class of breed.

* Read before the Little Plains Branch, Agricultural Bureau of N.S.W.

The use of grade sires or mongrel sires must be condemned, as with them it is utterly impossible to breed to a type—by "type" I mean the distinguishing characteristics in a breed. Without breeding to type you cannot improve your stock. If, however, a pure-bred sire of the same class of breed is used on each successive generation for five or six generations, the progeny then becomes practically of a fixed type and pure-bred.

Points to be considered in Breeding.

It is a very desirable achievement to "fix" a type by breeding on the lines just indicated ; yet there are other matters that must be duly considered and given effect to if such breeding is to be of any practical value.

The constitution and conformation of animals that are being mated must be thoroughly sound; otherwise one is apt to make serious blunders, and spoil the possibility of making good progress.

Constitutional unsoundness is generally the result of continued too close breeding, bad selection, and improper care and attention. But unsoundness of conformation, if of an hereditary nature, such as side-bone, ring-bone, spavin, thoroughpin, bad feet, &c., will be usually perpetuated in the offspring, and, therefore, it is wise for the farmer to closely examine his mares. If he is not competent to recognise the symptoms of unsoundness he should obtain the services of a qualified veterinarian. In any case he should only breed to pure-bred stallions that carry the Government certificate of soundness.

The idea of mating mare and stallion of opposite peculiarities is approved by many horse-breeders, but I consider that it is wise when mating to preserve the good qualities in the sire and dam as much as possible, and strive to eliminate the weak ones.

Treatment of Mare and Stallion.

It is necessary, in order to obtain the best results in the progeny, to work both the mare and the stallion. The former, after being stinted, should be given moderate work, where there is no chance of her over-straining or knocking herself about. Do not put a mare to active hard work immediately after service, as this is very likely to prevent the mare from breeding, and often brings on abortion. The stallion should be given plenty of work out of season, and both he and the mare should be given a liberal and nutritious diet, care being exercised to avoid getting either of them too fat.

Although some mares can be worked right up to foaling time without injury, care and common sense must be used by the owner, and if there are the slightest indications that the work is affecting her health, she should be withdrawn from such work and given a spell on good green pasture.

All mares should have recourse to good green pasture at least a month before foaling, and preferably pastures containing an excess of clover, lucerne, trefoil, or other leguminous plants. A highly nitrogenous pasture as food, assists in building up or nourishing the fœtus or foal in embyro, without developing too much bone before birth. This is an extremely important

matter, as many valuable mares are lost yearly through improper feeding prior to parturition, causing too much bone to form in the fœtus, which often makes the expulsion of it extremely difficult and sometimes impossible.

Rearing the Foal.

The mare is sometimes worked shortly after foaling—within a few days. This should be discountenanced, as it is not only cruel to the mare, but may cause permanent injury to her health and that of the foal. Three weeks at least should be allowed the mare and foal on good pasture before she is worked. She can then be put to steady work until she gradually resumes her normal state.

As mares vary a great deal in milking qualities, so will foals vary considerably in their development. The better milker the mare, the better chance the foal has to quicken its growth, until it has attained the age of from 6 to 9 months, when, according to the breeder's judgment, it may be weaned.

When weaned, it is desirable to place the foal on the best pasture available, and allow it access to good water, in order that it may not be retarded in its growth, till it is ready to be handled for work or for sale. This will be from 2 to 3 years of age, according to its development.

I feel confident that if the breeding of the different classes of draught horses were followed on similar practical lines to those which I have tried to explain, there would be a vast improvement in the future. We farmers and breeders could then view the advent of the farm motor tractor with less fear than our forefathers experienced when they had to face the advent of the railway in the beginning of the nineteenth century, which was responsible for a great set-back to the breeding, not only of the draught horse, but of all breeds at that time. There will always be plenty of work for a good type of horse, and a good market price for a first-class horse of any breed.

A Home-made Boring Drill.

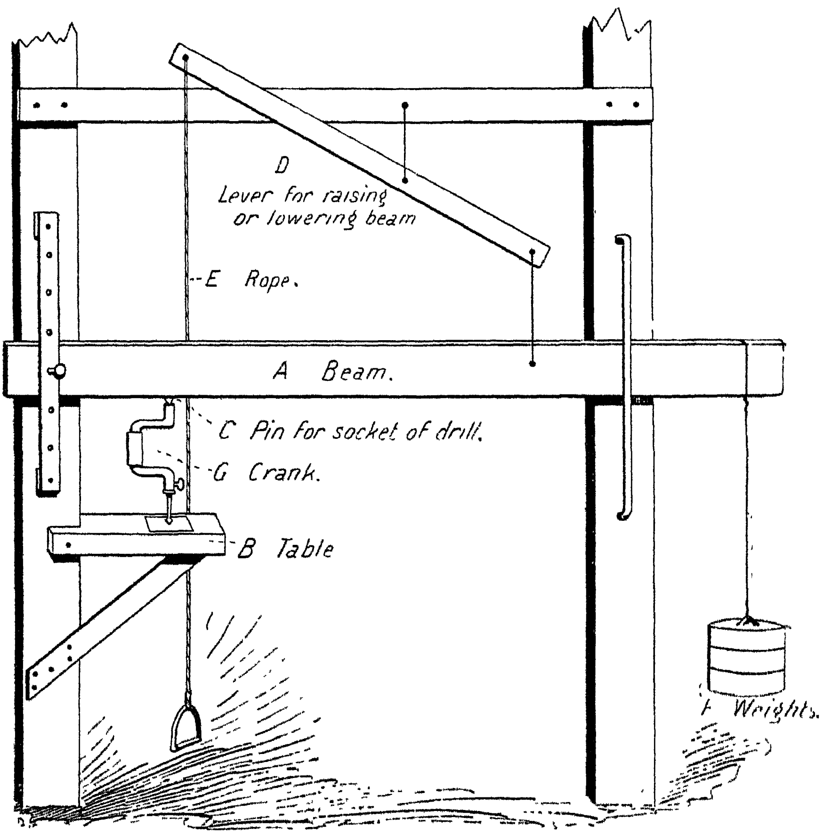
A. H. E. McDONALD, Inspector of Agriculture.

Mr. McLennan, of Oxley, Tamworth, has fitted up in his farm-smithy a very useful arrangement for drilling. It is practically as effective as a machine drill. Amongst other jobs, he was able with it to drill a large cast pinion, which was broken in five places, and finish the repairing in a few hours.

It consists simply of a beam about 8 feet long and 5 inches in diameter, and a crank for taking the drilling-bit. Two posts of the shed are used for supporting the beam (A). One post has holes bored in it at certain distances, and by means of a pin the end of the beam can be raised or lowered according to the size or shape of the piece being drilled. A batten, as shown in the illustration, kept out a certain distance from the post by blocks, helps to keep the beam in position at the hinged end, while an iron bracket is used at the other. To increase the pressure, weights are suspended from the end of the beam. These can be adjusted to the liking of the operator.

A pole stretches from post to post above the beam, and to this is attached the lever (D), to raise the beam. The lever is worked with the rope (E), either by hand or by the foot. A stirrup-iron is attached to the end, so that it can be easily worked in the latter way, leaving the hands free.

Beneath the beam is a table (B) for carrying the work to be drilled. A fairly heavy piece of hardwood timber, say 6 in. x 4 in., with a good strong stay, is required for the table.



Home-made Boring Drill.

In the beam (A) a small conical pin (C) is placed to take the upper socket of the crank (G). The crank can be made by an amateur without difficulty. A piece of 1-inch bar is required, bent to the shape shown in the illustration. The upper end should have a socket for the pin, and the lower a socket for the bit. A piece of sheet tin should be bent round the handle, with room to work freely, so that the crank may be turned easily.

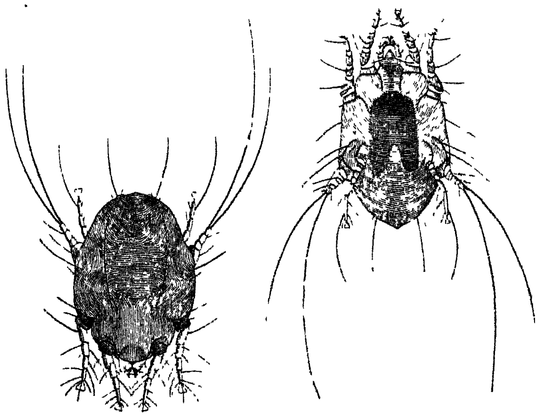
"Aphis Foot" of Horses in the Tamworth District.

(*Chorioptes equi*, Gerlach.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THE disease commonly called "Aphis foot" in the Tamworth district, has been known as one of those obscure diseases that appear at irregular intervals in the early summer months, when the grass and lucerne are growing most luxuriantly, and it usually attacks stock running on the lucerne paddocks and river flats. It is also remarkable that the animals with white feet or white patches on the body or legs, are the first to be attacked, and the disease always starts in the pink skin of the white areas.

The infestation first appears about the hocks, then spreads upward. The skin becomes scurfy and scabby, and suppurates; the hair falls out in tufts, and the skin cracks and bleeds as the animals rub their legs together on account of the irritation. The legs often swell up to almost twice their natural size in aggravated cases; and the scurfy, scabby skin works round the sides and flanks, particularly if the skin is white or pink.



A B

Mite (*Chorioptes equi*, Gerlach) causing Symbiotic Mange in horses in Tamworth district (greatly enlarged).

A. Dorsal surface. B. Ventral surface.

A horse in this condition has to be withdrawn from work, and treated with a mixture or dressing of oil, sulphur, or carbolic and oil, to stop the spread of the scab and to reduce the swelling; but very often after recovery the hair on the hocks is permanently destroyed, or grows out in irregular ragged tufts. When animals are badly attacked and neglected, they sometimes become so covered with ulcerated patches that they get maggotty, and have to be destroyed in extreme cases.

The name "Aphis foot" has been given to this infestation by the local farmers, because at the time when it first appears, the common green aphis is abundant upon the lucerne. The insects naturally get on to the feeding horses, and, of course, are more noticeable on the white patches than on the

dark parts. The aphides were said to bite the stock in the manner that flies would, and thus start the disease.

This obscure disease has been under the observation of the writer for some years, for he considered that the alleged cause could not be correct, the structure and biting power of plant-sucking aphides being quite opposed to their causing such injury.

The difficulty had always been that when the horses were brought under the writer's observation they had already been dressed with some healing mixture, and no living organism could be found on the blood and scab examined. This year, however, Mr. Clarence R. Dowe, with whom I have been in correspondence for some years on the subject, reported that Aphis foot had appeared among his horses some months before the usual time, and soon after they had been placed in the lucerne paddocks; and it has been through Mr. Dowe's interest in the matter that we have been able to discover the true cause of Aphis foot.

Reaching Attunga on the 14th July, 1911, with Mr. Dowe's assistance a number of horses, whose legs had not been dressed, were carefully examined, and the matter and blood obtained from the scabby hocks were found to be swarming with tiny mites. A quantity of material was collected, and packed carefully in tins, and a fine series of the mites have been mounted and examined microscopically in the entomological laboratory.

The mite that causes Aphis foot belongs to the family *Sarcophidæ*, which are popularly known as "Sucking-itch mites." It is one of the genus *Symbiotes*. The members of this group live upon the surface skin, but puncture the upper skin with their needle-pointed mandibles, and suck up blood, lymph, and serum.

Luggar (Second Report of the State Entomologist, University of Minnesota, 1896) describes several species, some of which are figured. Our species is apparently (if a new species) closely allied to *Symbiotes communis*, var. *equi*, the mite that causes foot mange in the horse in the United States. Nathan Banks in his "Catalogue of the *Acarina*, or Mites of the United States," 1907, places this species in the genus *Chorioptes*, calling it *Chorioptes equi*, Gerlach. Luggar says:—

> This mite attacks the heels and lower parts of the legs, especially the hind ones, and may be present for a long time, even years, before extending upon the body of the horse. Such mites live in colonies, without excavating galleries, and cause only a local mange or scab. The presence of these, as well as the restlessness of the invaded animals, shown by stamping and by rubbing one leg with the other, indicates the necessity of a local treatment. The male of this mite measures 0·34 by 0·30 mm.; the female 0·42 by 0·27; the egg 0·16 mm.

The figures given are drawn from living specimens obtained at Attunga, showing dorsal and ventral surfaces of the mite, greatly enlarged.

In Bulletin No. 5 (New Series) U. S. Department of Agriculture, Division of Entomology, Herbert Osborn deals with "Insects affecting Domestic Animals," 1896. He describes the mite as the *Chorioptes* of the horse, ox, and goat (*Chorioptes symbiotes*, Verheyen), and says:—

> This mite, unlike the itch mite, does not burrow into the skin, but adheres to the surface, or to hairs, by means of remarkable sucking organs attached to the leg. From this vantage ground it pierces the skin, and feeds upon the serous fluids.

The varieties occurring on the horse (*equi*), on cattle (*bovis*), and on the goat (*capræ*), are considered certainly as belonging to the one species, while there is some question as to the form occurring on sheep, mentioned later, and on the rabbit. The variety occurring on goats is credited with having ravaged the goats in the Grisons, in the Valley of the Prattigau, in Switzerland, in 1851, 1852, and 1853, when out of 2,500 animals half were attacked and 300 died.

Banks, however, does not consider the itch mites of the horse, ox, and goat to be identical, for he places the last two in the genus *Psoroptes*, and defines the one infesting cattle as *Psoroptes bovis*, Gerlach, and the goat mite as *Psoroptes ovis* of Hering.

I can find no reference in any reports on these mites in America to the remarkable fact, that the white legs and white patches on the animals are always the first parts infested by these mites in Australia; and it is also evident that the "foot mange" of the horse in the United States, if identical with "aphis foot," is not such a serious infestation as it is in Australia.

Remedies and Treatment.

Horses showing signs of this infestation should be yarded, and the infested areas well washed with hot water and soap. When clean, the parts should be dressed with some mixture that will destroy the itch mites remaining on the skin and hair, which are then exposed.

The usual remedy in the district is a carbolic wash, made of one part carbolic to ten parts salad oil and twenty parts of water, shaken up well, and applied with a cloth or soft brush. If pure carbolic is used it should be made weaker.

In dealing with the allied sheep scab mite, sulphur and tobacco, and lime and sulphur are extensively used for dips for infested sheep, and either of these combinations would soon destroy the itch mites. Where the infestation was extensive, and there were a number of horses to treat, it might be advisable to construct a shallow pit or trough, place it in a crush, and let the horses walk through the mixture, where the lower portion of the legs and hocks, which are the chief seat of infestation, would get a thorough soaking.

Curtice's Dip for Sheep consists of tobacco and sulphur boiled, strained, and used hot; applied twice with an interval of ten days. The quantities are 35 lb. tobacco waste and 10 lb. of sulphur to every 100 gallons of water.

A popular Australian dip was composed of lime and sulphur, boiled as is done in mixing lime and sulphur spray—100 lb. sulphur and 150 lb. quicklime to 100 gallons of water—and then diluted to a third strength with more boiling water.

Mr. Max Henry, M.R.C.V.S., Government Veterinary Surgeon, supplies the following notes respecting Symbiotic Mange in Horses:—

Symbiotic mange usually occurs in winter and towards spring, mostly in young or untended horses, and should be treated by clipping the hair from the legs as far as possible, washing the part thoroughly with warm water and soda, and dressing with sulphur ointment; strong solution of tobacco; kerosene and oil (1 in 3); benzene; or other parasiticide.

In case of unbroken stock, it would be as well to throw, clip, and thoroughly dress once; and then crush, clip, and dress a second time.

The approved sheep dip was 1 lb. each of sulphur and tobacco to 5 gallons of water.

TOBACCO-GROWING IN NEW SOUTH WALES.

DURING the first half of this year, Mr. John Gilmour, Tobacco Expert of the Department of Agriculture, visited the various tobacco-producing districts, and has furnished some notes upon the prospects of the industry.

Over 400 tons of tobacco have been raised in the State this year. In the Northern district, including Manilla, Keepit, New Mexico, Tamworth, Attunga, Somerton, Tintinhull, and Moonbi, from 250 to 300 tons were harvested. In the Western district, in the neighbourhood of Bathurst, 100 tons have been raised—the largest quantity for some years. The southern district (Tumut), once the leading centre, was only responsible for 20 tons of crop, but the crop would probably have reached 90 tons if it were not for a very destructive wind and hailstorm when it was nearly ripe for cutting.

In the north, all the places visited contain good tobacco-producing country, and the crops looked very fine. Mould affected the young plants at the beginning of the season, but as nearly all the growers had plenty of seed-beds, the land prepared could be sown. The largest growers are flue-curing, but more shed-room is required, and will doubtless be provided, to handle the crops quickly and avoid risk from rain or frost.

In the Bathurst district the season is short, allowing little time to gather the crop before the frosts kill the leaves. Flue-curing is not practised. A slight alteration is to be made in the placing of the leaves on the poles in the field, making more use of the sun and giving a better colour of leaf.

Around Tumut, tobacco has been grown for nearly forty years without using fertilisers, showing the productivity of the soil and climate of the district. At one time the quantity produced exceeded the demand, and the article became a drug on the market. Mr. Gilmour now recommends the judicious use of a good tobacco fertiliser, with which these splendid soils can be made as productive as ever.

NOTE.—In Farmers' Bulletin No. 17, Mr. F. B. Guthrie, Chemist of the Department, recommends the following fertiliser for tobacco:—

	Quantity per half ton.	Cost. £	s.	d.
Sulphate of ammonia	4 cwt.	2	12	0
Superphosphate	$3\frac{1}{2}$ cwt.	0	17	6
Sulphate of potash	$2\frac{1}{2}$ cwt.	1	13	9
	10 cwt.	£5	3	3

This mixture contains—

Nitrogen ...	=	8 per cent.
Phosphoric acid	=	6 per cent.
Potash	=	13 per cent.

Applied at the rate of 6 cwt. per acre, this will give—

$53\frac{3}{4}$ lb. nitrogen
40 lb. phosphoric acid } per acre,
$87\frac{1}{2}$ lb. potash

at a cost of £3 1s. 11d. per acre.

Lucerne and Honey.

J. E. O'GRADY.

No matter what may be the staple crop of any district, farmers may nearly always find some minor crop which fits in well with their operations, and which will, without much capital, turn in sufficient profit to pay the interest on the mortgage, or to provide a welcome cheque at an opportune time. The purpose of this article is to invite attention to the subject of bee-culture in those districts where lucerne is now being largely planted for the first time. Every district which produces large quantities of lucerne is specially suited for bees. Along the Hunter, and about Tamworth, considerable profits are derived from bees, either by specialists or by farmers who make bees a "side-line." In other districts hundreds of acres are now being laid down with lucerne; and we wish to show how farmers, while deriving great advantages from their lucerne, may perhaps still further improve their position by introducing the busy little bee.

Sources of Honey.

The honey which is at present most in favour on the Sydney market is the product of the Central tableland and slopes, where the bees draw their supplies from the flowers of box and other native trees. It is pleasing to know that our wild Australian timbers give a honey-flow which is at least equal to the best; but box-honey is not produced in sufficient quantities to supply the local market. This is partly because timber is giving way to wheat and other crops, but largely—almost wholly—because of the uncertainty in the time of flowering of our native trees. Box-honey has an enviable reputation; but this uncertain flowering makes the industry very insecure when the native timbers alone are relied upon. A friend of the writer, on the Central tableland, got 1½ tons from sixty hives in 1907; but his bees have not been able to accumulate any surplus since, though he has good hopes, from the indications of Nature, that the timbers will flower well this coming season.

Lucerne flowers regularly every summer, and several times during the summer, as the new growth follows the mower. Lucerne provides nectar of excellent quality, of such quality that in the United States, besides being the king of fodder plants, it is also regarded as the most important honey-plant of the west.

When it is remembered that the visits of bees are essential to the setting of lucerne seed, it will be seen how intimately the two crops, lucerne and honey, are connected.

A Practical Example.

A contrast to the experience of the gentleman mentioned above is afforded by that of Mr. T. G. Adamson, "Ngoora," Nemingha, near Tamworth, a district in which lucerne is extensively grown. A few years ago Mr.

Adamson established an apiary, working on the shares system with Mr. Geoff. G. Phillips, who learnt his business under Mr. W. Hessel Hall, M.A., of the well-known Lapstone Apiary, Emu Plains. Mr. Adamson provided the capital; Mr. Phillips attends to the bees. There have been no years of failure, and none are expected. In 1909 the output reached 9 tons. In 1910 it dropped to 7 tons, due to the unprecedented late frosts of that year, which destroyed the spring blossoms of all kinds. This year, 1911, the output is expected to reach 12 or 15 tons, and the colonies have been increased to 156. As bees travel considerable distances, it is not possible to say how much the partnership bees contributed to the excellent crop of lucerne seed which Mr. Adamson harvested last season; but certain it is that without bees that crop would have been impossible, and the bees were there on the property, ready and willing for the work.

Bees at Nemingha.

Mr. Phillips was kind enough to indicate what, in his opinion, were the possibilities before a practical farmer who has not had the advantage of a training in apiculture. But, before going on to this, we shall briefly deal with the industry at Nemingha, so that the conditions where bee-keeping is certainly successful may be compared with the reader's own.

The Nemingha Valley, on the Peel and Cockburn Rivers, embraces large areas of alluvial flats, for which lucerne is an ideal crop. It has been grown in the district for fifty years, and its cultivation is extending as land is opened up. The flats, in their virgin state, are covered with red, blue, and white gums, apple and box. The higher lands are also chiefly box and gum, smaller in size. But the flats are being rapidly cleared, and the higher land, where not cleared for wheat and maize, is mostly ring-barked; so that the supply of honey from native timbers is diminishing.

Mr. Phillips, observing the flowering of the trees and plants, considers that his bees draw nectar mainly from the following, in descending order of value:—

1. *Lucerne.*—This plant flowers freely from November to February inclusive, and during that period the product of the hives is mostly lucerne-honey. Lucerne-growers aim at mowing their crops when about one-tenth in bloom, so that there is a conflict of interest between farmer and apiarist. But the mower does not always cover the ground as rapidly as the farmer wishes. Moreover, there are always plenty of lucerne men who are having a "shot" at a crop of seed, which means that the blooms are left to be fertilised by the bees. The result is that there is always a good supply of lucerne-bloom; though the claim made in America, that an acre of lucerne will feed a colony of bees, is certainly *not* realised.

2. *Apple and Yellow Box.*—These are about equal for second place, though far below lucerne. The apple-trees flower from February till the end of March, and the yellow box from July to the end of October. For the four years that Mr. Phillips has been in the district, both these timbers have flowered regularly during the months named; but, apart from the risk of non-blooming, they are vanishing before the plough.

3. *Gums* of different kinds. On the hills the gums flower pretty regularly about March, but the river gums are not so reliable. They are generally the last of the main honey-plants to flower, and after them there is nothing much for the winter except an odd box-tree.

4. *Cat's-head,* a weed of evil repute, has the redeeming feature of being a honey plant, and old residents say that before lucerne was largely grown good crops of honey came from it. Mr. Phillips has seen the bees working on it. This is an ill wind blowing the apiarist some good.

5. *Variegated thistle,* another unwelcome plant, which gives trouble in a paddock of baby-lucerne, supplies the bees with pollen to feed the young ones. It flowers throughout the year in neglected places.

6. *Maize,* flowering about Christmas or a little later, provides pollen, and perhaps honey.

The variety of feed results in a variety in the colour of the honey; but inasmuch as the flowering periods of the different plants overlap, it is not definitely known which colour is attributable to each plant.

The effect of this succession of blooms is that honey may be expected all the year, except from March to July, when there is practically no flow. At Nemingha, as in most districts of New South Wales, the expensive and troublesome system of wintering bees, which has to be practised in colder climates, is altogether unnecessary. The bees are left to go into the winter with 20 or 30 lb. of honey in each hive. This, with what the bees can gather during the winter, is sufficient to keep them strong. If a swarm should come out too late to gather enough winter food before the flow ceases, there will always be surplus combs of honey in the apiary to give them. The expression "robbing bees," is incorrect, because an apiarist does not rob his bees; he simply removes portion of the surplus honey, which the bees store up against the time of scarcity. If the balance fails to keep the bees in health, he is prepared to give back the quantity required to take them through the winter.

The flows of honey come periodically, depending a good deal on the weather. When the honey-plants are blooming freely the frames will be seen to be filling up with honey. They are removed before they are completely filled, so that the bees will not be crowded for honey-room. If honey is coming in freely, and there is no room for it, the colony will cast out a swarm, to seek another home. This swarming depends a good deal upon the strain of bees, but more upon the management. A good strain of bees, carefully selected by keeping records, and properly managed, will rarely swarm.

The combs are uncapped, and the honey is extracted by means of a reversing extractor (made by Messrs. Pender Bros., of West Maitland, in this case), and the combs are then replaced for the bees to continue their work. "Ngoora" honey is sold in 60 lb. tins, and fetches from £20 to £30 per ton. Bottling and selling retail is more profitable, but would involve a larger plant and more labour.

As the apiary has now practically reached its limit of profitable extension, there is a good deal of surplus wax for sale. This is obtained from

the uncapping of the combs and from "burr combs," and fetches about 1s. 2d. per lb. wholesale. From 156 hives, with a 9-ton flow, there would be from 3 to 5 cwt. of surplus wax; but in building up an apiary the surplus would be absorbed in making "foundation."

Mr. Phillips estimates that within a 6-mile radius of Ngoora Apiary there are about 1,000 hives. Bees will certainly travel 3 or 4 miles for honey, as has been definitely proved at Lapstone Apiary; so the Ngoora workers probably share their feeding-grounds with all these 1,000 colonies. It is quite possible for a man who knows his work, and has proper appliances, to look after 200 hives, but owing to the number of bee-keepers in the neighbourhood Mr. Phillips does not wish to extend any further. Of course an "out-apiary" might be established some distance away, but this is not contemplated at present.

"Foul brood," the dread of the amateur, has never appeared at Ngoora. Should the evil-smelling disease present itself, Mr. Phillips would adopt the standard remedy of removing the bees to a box, letting them build wax of any honey they have, and, boiling the wax, whilst the infected hive would be promptly burnt. A suspected case of paralysis occurred once; the hive was re-queened, and the trouble disappeared so quickly that it cannot be said whether it was really paralysis or not. Moths are in the district, as everywhere, but do no damage at Ngoora. Leather-coloured Italian bees are used, and these will keep the moths away themselves if the hives and frames are so arranged that the bees can march all round the interior of the hive. The frames swing at each end, and there is a space at each side and underneath. The frames rest on a metal rabbet about the thickness of a penknife blade. This is the construction of an up-to-date factory-made hive. A moth entering a hive tenanted by healthy bees is stung to death as soon as discovered, and the body cast outside. If she has had time to lay any eggs, these are swept off the premises, as bees will not tolerate trespassers or rubbish in the hives. The notion that moths kill out swarms of bees is an erroneous one; the bees are generally dead before the moths enter.

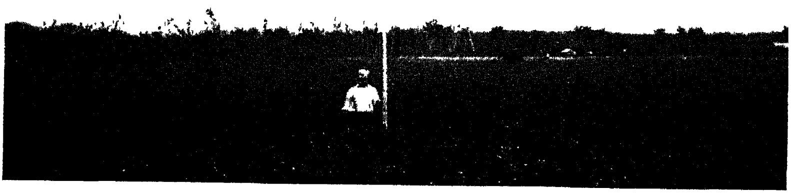
Dysentery is unknown in the Tamworth apiaries.

Possibilities before Amateurs.

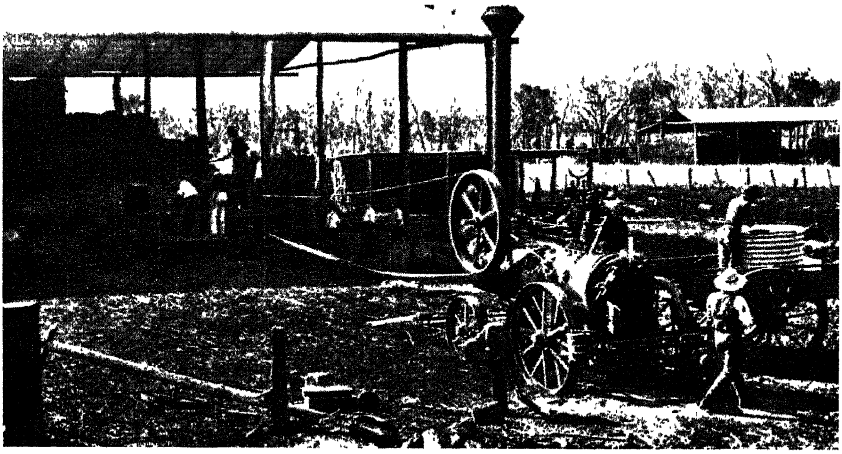
Mr. Phillips was asked what advice he would give to a farmer who knew nothing about bees, but who lived in one of those districts where lucerne is being laid down in hundreds of acres per annum, and who wished to avail himself as much as possible of the honey provided by the crop. He replied that no matter how small an apiary may be, it will not succeed unless it can be given regular daily attention in the summer; and this, of course, a busy man could not give. But it is quite possible for an intelligent lad of 15 or 16, say a farmer's son, to work up an apiary of fifty hives, giving them his whole attention during the honey season. A yield of 1 cwt. of honey per hive might fairly be expected in a new district.

The future apiarist should, first of all, learn something about bees. Several elementary books may be purchased from leading booksellers, but the standard book of reference, which Mr. Phillips considers every apiarist

The Apiary at Ngoora Farm Nemingha.



Three-year-old Lucerne, 3 ft. 10 in. high, Ngoora Farm, Nemingha. (Mr. T. G. Adamson.)
Alfalfa does not normally exceed 4 feet in height.—COBURN.



Chaffing Lucerne Hay, Ngoora Farm, Nemingha.

"The Blue Hole"—a bend in the Peel River at Nemingha, which has never been dry in the white man's time.

Mr. Adamson recently sank a well in a paddock of lucerne, in its third year, on the flat above this spot. Lucerne roots were traced to a depth of 17 feet, when they were lost. Water was struck at 18 feet. It would appear that the small feeding roots have already reached the water, which soaks through a bed of gravel beneath the surface of the flats.

should have, is the "ABC and XYZ of Bee Culture," by A. I. Root and E. R. Root, published by the A. I. Root Company, Medina, Ohio, U.S.A., and obtainable from Sydney booksellers at a price of about 6s. This is in the form of an encyclopædia, and the 1910 edition has the latest information on all subjects. The beginner should first read an elementary text-book, and then use the "ABC" for more detailed knowledge.

"Gleanings in Bee Culture" is a magazine published twice a month by the Root Company. The "Australian Bee-keeper," by Messrs. Pender Bros., Maitland, and the "Australian Bee Bulletin," by Mr. W. Abrams, Beecroft, are monthly Australian magazines devoted to bees.

A beginning should be made with ten hives of ordinary hybrid bees. These would cost about £10. A "select tested breeding queen" should be purchased, at a cost of 15s., and placed in one of the hives, her progeny being used to "re-queen" the other nine hives. The breed recommended is the leather-coloured Italian.

The hives at Ngoora have a body and four "supers," and would cost £1 before a bee goes into them, but the beginner should only buy the body and one super. Stocked with hybrid bees, such a hive would cost about £1. The breeding of queens will be understood from the books recommended above.

As the hives get stronger, more crates, or supers, must be added, and new hives purchased or made. A man handy with tools can make his own hives, but it is questionable whether it pays to devote time to producing a home-made article. A good factory-made, lock-cornered, frame hive will last twenty years. Mr. Phillips favours ten frames in the hive, though some prefer only eight.

The next requirement is a bee-tight honey-house. If it is not bee-tight, "robbing-matches" may occur through neglecting to cover up the honey and combs. The best way to construct the honey-house is to make it of two stories, preferably partly dug out of the side of a hill. The advantage of the two-storied house is that the honey can be extracted on the top floor and run into tanks below by gravitation. The hill-side construction enables the combs to be delivered on the top floor without climbing steps. Still, it is not absolutely necessary. If honey is to be sold wholesale in 60 lb. tins, a room 10 ft. x 8 ft. would do for an apiary of fifty hives; but if it is to be bottled for the retail trade more space will be required, and a two-storied 10 ft. x 8 ft. structure is recommended. It is easy to work out the cost of this for a particular district.

The plant required would be an uncapping tank (Dadant), extractor, honey tank, and solar wax-extractor. These would cost about £6 altogether. A recent improvement is Beuhne's cappings reducer, which does away with the uncapping tank and solar wax-extractor. This costs about £5 10s.; or, with extractor and honey tank, about £9. The advantage is that it is not necessary to wait for a sunny day to extract wax, and in many districts this advantage will, in practice, be found to be well worth the difference in price.

With this plant, the amateur should be able to work up to fifty colonies of bees. The wax produced is sent to the "foundation factory," where it

is made into foundation for new combs at a cost of 6d. per lb. When the apiary is complete, the surplus wax is sold.

The best time to start is when a strong honey flow is commencing. This will vary with the plants, but in good lucerne country it would be about October. Of course, a start can be made at any time, but if it is winter it will be necessary to see that the bees have enough honey to carry them through.

Lucerne Seed.

The value of the bees to the lucerne is that they fertilise the flowers for seed; and we must draw attention to the very fine plate which has been prepared in the Government Printing Office to illustrate the seed industry. The specimens have all been supplied by Mr. Adamson from Ngoora Farm. The plate shows the correct stage of ripeness for harvesting the seed.

The first pair of pods are too green—the seed would be immature. The second pair are at the right stage for harvesting. It will be noticed that they are slightly on the green side. The seed inside is of the same colour, but will ripen a little after cutting, and give a good golden-yellow sample. Of course it is impossible to get a paddock of lucerne all at this stage together, but this is the ideal, and the mower should be put in when as many as possible of the pods are at this stage.

The third pair of pods have gone dark brown. They are over-ripe, and have probably shed some of their seed. More would shed in the process of harvesting, and very little would be left to thresh. What was threshed would be the colour of the pod. Tamworth men claim that this is good seed, provided it is plump; but the market does not like it, and if a bag were sent to Sydney containing a large proportion of it, the good name of Tamworth lucerne seed would suffer.

The enlarged seed shown is of the correct colour, and has been taken from a bag with which Mr. Adamson won first prize at Sydney Royal Show. 1911.

It was suggested to Mr. Adamson that in supplying these specimens he was really giving powder to the enemy, as he was showing other districts how Tamworth seed is produced. He replied that there is something in the soil, or the climate, or the underlying Peel waters, which makes Nemingha Valley an ideal place for lucerne seed; just as a certain district of France can produce champagne with which no other can compete. However that may be, newspaper reports from time to time of successful crops of lucerne seed show plainly enough that there are other districts in New South Wales besides Tamworth, the Hunter, and Mudgee where lucerne seed can be grown profitably.

Let us conclude by earnestly entreating our readers to have at least a little patch of lucerne on the farm. It is not every district which can develop into a Nemingha Valley, with the sun playing on the emerald flats, whilst the clouds chase each other on the Moonbi Ranges. We should like to see the whole of Australia like that, but we have not everywhere the soil, the sunshine, and the underground waters together. Still, this great perennial fodder plant will grow upon any soil which is fairly deep and

H. S BURTON LITH W. A. GULLICK, GOVERNMENT PRINTER.

LUCERNE SEED.

1. PODS TOO GREEN TO HARVEST.
2. THE RIGHT STAGE FOR HARVESTING.
3. PODS TOO RIPE TO HARVEST.

open. The soil may require lime, manure, inoculation with bacteria, or any or all of these; but lucerne can be grown upon it. At Cowra Experiment Farm there are 14 acres of it, yielding splendidly on ordinary Cowra wheat land. The Hon. J. R. Black has obtained similar results at Boggabri, 3 miles from the river. Other instances of unexpected success could be quoted—they are at least as numerous as the failures. We are first and foremost a community of stock-breeders; and lucerne is the fodder plant which has come down to us through the ages, always known as the best. No man should say that it will not thrive on his land until he has tried it again and again.

Farmers' Bulletin, No. 37, dealing with the cultivation of lucerne, may be obtained free by any farmer upon application to the Under Secretary, Department of Agriculture, Sydney.

Lucerne and Maize for Fattening Stock.

The Agricultural Experiment Station of the University of Nebraska has recently carried out some experiments in the fattening of steers on different fodders, and the results show some points in such an unmistakable manner that a few notes should prove interesting to New South Wales farmers. The details are given in Bulletin No. 116 of the Station—"Economical Beef Production," by H. R. Smith, B.Sc.

In the first experiment, four groups of two-year-old grade Angus steers, with ten in each group, were fed for twenty weeks on different fodders with the following results:—

	Corn, 78 per cent; bran, 22 per cent.; corn stover.	Corn, 90 per cent.; linseed-meal, 10 per cent.; corn stover.	Corn, 90 per cent.; cotton-seed meal, 10 per cent; corn stover.	Corn, 100 per cent.; lucerne hay and corn stover (equal parts).
	lb.	lb.	lb.	lb.
Average initial weight per steer ..	973	976	988	978
Average daily gain per steer ...	1·76	2·33	2·11	2·42
Average amount of grain consumed daily per steer	24·97	23·02	22·83	22·33
Average amount of roughage consumed daily per steer	8·91	8·96	8·89	9·77
Total food consumed for 1 lb. of gain	19·25	13·73	15·04	13·25

The smallest daily gains were made with bran, and the highest with lucerne, as the medium for supplying the protein in which the maize is deficient. Costs are also given, but are not strictly comparable with our conditions. Still, the fact that lucerne can be grown on the farm whilst bran must be purchased, must make lucerne cheaper than bran.

The second test comprised four groups of two-year-old grade Shorthorns, fed for twelve weeks, and gave very similar results, as the following table shows —

	Corn, 75 per cent.; bran, 25 per cent.; and corn stover.	Corn, 90 per cent.; linseed-meal, 10 per cent.; and corn stover.	Corn, 90 per cent.; cotton-seed cake, 10 per cent.; and corn stover.	Corn, 100 per cent., lucerne; and corn stover.
	lb.	lb.	lb.	lb.
Average initial weight per steer...	1,033	1,025	1,034	1,046
Average daily gain per steer ..	2·53	2·43	2·80	2·55
Average amount of grain consumed daily per steer	21·20	20·99	21·03	19·86
Average amount of roughage con-consumed daily per steer ...	7·61	8·03	8·89	8·79
Total food consumed for 1 lb. of gain	11·37	11·92	10·26	11·22

The cattle in this experiment were purchased by Swift & Co., of South Omaha, and slaughtered by them, records being made on the dressing of each steer, the shape and covering of the carcases, and the texture, colour, and marbling of the meat. Each carcase was appraised by an expert of the Company on the basis of existing market quotations for dressed beef, without knowing how the beasts had been fed. The values assigned per 100 lb. were as follow :—

Group I.—Corn and bran	10·12	dollars.
,, II.—Corn and linseed meal ...	10·21	,,
,, III.—Corn and cotton-seed cake ...	10·29	,,
,, IV.—Corn and lucerne	10·42	,,

In other experiments the value of corn stover in the ration had been clearly shown. Not only did this provide an economical use for what is often regarded as a useless product, but the steers actually made greater gains per day when it was added; and, moreover, it was found to correct the tendency to scouring which appeared when corn and lucerne alone were fed. But it was also found that "snapped" corn had the same beneficial effect without corn stover, probably because the husk and cob serve the same purpose in lessening the tendency to scour, whilst giving variety to the ration.

The authorities of the Station were then satisfied that corn and lucerne formed the best fodder for steers, and further investigation was directed towards ascertaining the most economical proportion of corn. In these tests it was found that heavy feeding of shelled corn (19·8 lb. per day), with lucerne hay and corn stover, gave a daily gain of 2·55 lb. per head, as against 2·34 lb. when 17 lb. of corn per day was fed, and 2·34 lb. with 12 lb. corn per day. The proportions of lucerne and stover in the roughage were about equal. The values of these mixtures, of course, depend upon the relative market values of corn and lucerne at the moment. When corn-meal was used with lucerne (no stover), the best results were obtained from a medium feed of corn—15·6 lb. per head per day. This gave 2·86 lb. daily increase, as against 2·73 and 2·71 lb. from 18·8 and 12 lb. corn-meal respectively.

The value of all this lies in the fact that maize and lucerne can be combined into an excellent feed for fattening steers, either grinding the corn-cobs or feeding stover with the ration. Similar results would certainly be obtained with sheep, pigs, or other fattening stock. Very often a man has good corn and lucerne ground so far from a railway or port that if he sends his produce to market in bags and bales, his returns are considerably reduced by heavy cartage bills. Will these notes suggest to him what he might do?

The Production of Maize on the South Coast.

R. N. MAKIN, Inspector of Agriculture.

THE South Coast, which has practically been the cradle of the dairying industry of the State, produced a great quantity of maize before that industry became so well established. To-day, a quantity of maize is grown for grain on soils adapted for it, particularly in the Pambula, Bega, Shoalhaven, and Kangaroo Valley districts, and many paddocks, at one time thought to be inexhaustible of their plant-food, are showing the effect of continuous cropping. One hears old hands speak of the great crops in days gone by, and the trouble experienced in keeping clover out of the crops. That trouble, alas, is not experienced now. We are doing our best to get clover to grow, as there is nothing better for returning humus or vegetable matter to a depleted soil.

Maize is about the most nutritious of all grain, and should have more attention than is given to it at present by our farmers. New South Wales and Queensland are the two leading maize-growing States in the Commonwealth. Queensland should, in the near future, be a very large producer, owing to her great maize-growing area. In New South Wales most of the crop is produced along the Coast, including the rich flats on the Hunter and Hawkesbury Rivers, and around Inverell, Tumut, and Tamworth.

Comparing our output with that of the United States of America, we find that for the year 1910, the total output of maize in the United States was 3,121,000,000 bushels, or more than half as much again as the output of all other grain crops combined. New South Wales produced, in 1910, 7,698,255 bushels of maize, against 30,867,759 bushels of other classes of grain. In the United States, eleven prominent corn States produce over 75 per cent. of the maize crops, and these States are responsible for 60 per cent. of the stock raised. This goes to show what is done with their big yield.

We should grow more maize. We should open up more markets in the non-producing States and New Zealand. On suitable soil, maize gives a greater yield per acre than wheat. It should be grown on a systematic basis, as wheat is now grown; its culture, marketing, feeding, pests, &c., must be studied.

Present Cost of Production.

During the last three years I have been watching the cultivation of maize on the South Coast with interest, and at the same time learning much from the experiments carried out by the Department in the different districts. This year we opened up work in growing maize for grain, and I have been brought in contact with many growers in the different districts. Being under the impression that there was only small monetary return from maize grown under systems in vogue on the Coast, I made it my business to consult

some of the leading growers as to the cost of production. I have asked, not one grower, but dozens the question, "What does it cost to produce a bushel of maize?" and in every case met with the answer, "I do not know." Each grower admitted that it was not paying as it should, but could not say why.

Why do farmers not keep books? Most folks entering into a business keep books, otherwise they do not know how they stand; and is not maize-growing a business? The profit on every product depends upon the cost of production, and the producer must know that cost before he can estimate what is a payable selling price.

On going into the cost of production with some of the best authorities in the different maize-producing districts on the South Coast, four estimates for labour and rent of land averaged as follows—the average yield being in two cases 60 bushels, and in two 50 bushels:—

	£	s.	d.	
Ploughing and harrowing	1	3	0	per acre.
Planting	0	3	0	,,
Seed	0	1	1	,,
Scuffling	0	10	3	,,
Pulling, husking, and carting ...	1	5	10	,,
Shelling	0	7	9	,,
Bags	0	7	6	,,
Rent of land	1	15	0	,,
Tax on land	0	1	11	,,
	£5	15	4	,,

The average yield of 60 bushels per acre for Bega district and 50 bushels for Shoalhaven is a little high to my mind; however, I am quoting the figures given me. In some cases the prices for labour were a little under prices ruling at present.

Taking the items separately, I find most farmers harrow twice after ploughing; and in the accounts given me, ploughing and harrowing ranges from £1 10s. to £1 per acre. In all cases single-furrow ploughs were used.

Planting ranged from 5s. 6d. to 2s. per acre. I was astonished to learn that some still plant by hand. The estimate for hand-planting is 5s. 6d. per acre.

Seed was valued at from 1s. 3d. to 1s. per peck. Only one estimate included artificial manure, and that was at 6s. per acre. Scuffling (one estimate including chipping) ranged from £1 to 4s. Pulling, husking, and carting ranged from £1 15s. to 18s. 6d. Bags were quoted at current rates, about 7s. 6d. a dozen.

Rent of land ranged from £1 10s. to £2 10s. This is an item about which much may be said. Briefly, it is really not fair to debit the crop with the whole of the rent, as two crops should come off the paddock; but I find in most cases that farmers do not adopt that practice. When the maize is pulled, cows are turned in to consume any feed that may be left, and later on the land is ploughed again for maize.

These figures only embrace the period from the time the plough enters the ground to the time the maize is in the bag. To this, to be complete, should be added cartage to boat or train; boat or train freight; wharfage; cartage again; and commission. All of these put pence per bushel on to the cost, so that with the cost of production running out at about 27·44d. per bushel, as shown here, and the average market price given me (3s.), there does not remain much of a balance to pay for the marketing, interest, insurance, and depreciation of horses and machinery, which should all be included in cost of production.

Production must be Cheapened.

In the United States, where maize-growing is carried out on extensive scales, the cost of production runs from 14·6 cents to 30 cents per bushel. We are at fault somewhere. We must produce the crop on a cheaper basis. How?

Early Leaming Maize. Mr. W. Harris, Dapto.

The single-furrow ploughs must go. Multiple-furrow ploughs must take their place. It pays even the small grower to see to this.

Harrowing must be done more cheaply by using such harrows as will cover more ground.

Hand-planting is out of the question altogether. Machine-planting is much more satisfactory in every way, and where a quantity of maize is grown the double-driller should be used. The ordinary wheat-drill may be fixed up to sow maize, and does very well; but for really good work, and planting on the check system, the double-driller does what is required.

Many farmers have their crops pulled and husked in the paddock, paying 5d. or 6d. per bag. This an extravagant practice, as in husking, if the grain is at all ripe, a quantity is rubbed off the tips and butts, whereas if husked in the barn it may be swept up and used.

The old system of husking and shelling must also go There are machines on the market now doing both operations satisfactorily and reducing the cost very much. The work has been carried out in other parts of the State under contract at 7d. per 4-bushel bag, which is very much below the prices paid on the South Coast for hand labour.

Maize and the Pig.

The next question is, "What are we going to do with a big crop when we get it?" It is well known that maize is the most valuable grain we have for stock. Sir J. B. Lawes called it "the most superb crop that grows." It may be fed to practically all classes of stock, but to none more profitably than to the pig.

Those farmers who grow only a few acres of maize, instead of attempting to market the grain, would do much better by paddock-feeding pigs. This system of pig-feeding has much to commend it, and there is no more economical way of marketing the crop than in the form of pork or bacon. Still, there is much room for improvement in the pork and bacon industry. It needs building up in the same manner as our butter industry has been built up. It is not many years ago since butter used to reach very low market prices, but thanks to an export trade, we are producing each year greater quantities, and the price keeps fairly even. At present there is little more than a local demand for pork and bacon. We should launch out on a larger market. Why should China be sending pork to the English market in such quantities, whilst we are not? Once our pork industry is well established, we shall find that maize-growing becomes much more profitable.

Varieties of Maize.

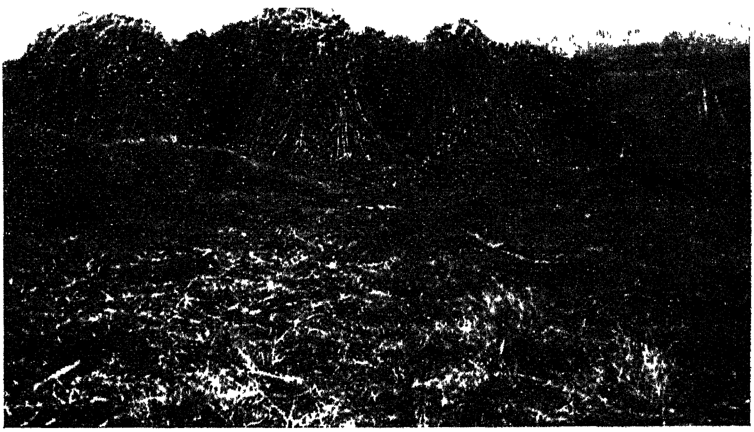
With regard to the varieties, the only variety which I can find growing true to type is Golden King, or, as some call it, Hawkesbury Champion. I am surprised at farmers sticking to this variety, as it is a most undesirable one. It is one of the slowest to mature; it is too shallow in the grain; it has too small a germ; it is too coarse in the stalk; and it has the largest core of all the varieties I have seen. Of a number of samples of maize submitted to me at a lecture in Dapto, two exhibits of this variety gave $35\frac{4}{7}$ths and $33\frac{1}{3}$rd per cent. of core respectively; whilst a quick-maturing variety, Early Leaming, gave about $16\frac{3}{4}$ per cent. of core.

For the last three years I have been watching the maize exhibits at different agricultural shows on the South Coast, and have noticed strange mixtures among the exhibits. We want pure varieties, and we want varieties for Australian conditions, just as we have wheats for Australian conditions. As maize inoculates easily, care must be taken, once one has a pure variety,

to keep it pure. I find farmers on the South Coast are seeking for pure varieties. It is generally admitted that the old varieties are too much mixed up, and it is the exception to see anything pure except Golden King, which is entirely a maizena maize.

Mould-board *v.* Disc Plough for Maize.

Mr. A. L. Jeffery, Summer Hill, Moruya, raises the question as to which is the more profitable for maize-growing, the mould-board or the disc plough. Both styles of plough are employed on the South Coast, but there is more satisfaction from the mould-board. A good mould-board plough completely inverts the sod, whereas the disc does not; and for the disc to do effective work the ground must not carry much trash.



Maize Stover. Mr. A. Bellchambers, Bombala.

Several farmers, to my knowledge, have disc ploughs lying idle; but this is wrong. The disc is the more valuable implement for cross-ploughing. It beats the mould-board plough in this respect, that it pulverises the sod more, without disturbing the subsoil.

To prepare a patch for maize, it is most desirable to plough deeply in June or July, and let the ground lie fallow—occasionally stirring the surface to conserve the moisture—until planting time, and before planting to cross-plough, turning a shallow furrow.

Farmers make a great mistake in sticking to the single furrow mould-board plough. There are numerous types of multiple furrow ploughs on the market, which do excellent work, and mean a saving of time and money.

Lucerne in Cultivated Rows for Dry Districts.

This is not a new idea, but we doubt whether it has received a fair trial in the drier portions of the State. Cultivation, checking evaporation, should enable us to grow lucerne under much drier conditions than we are doing now.

Messrs. Brand and Westgate, of the United States Department of Agriculture, have recently issued a pamphlet, Circular No. 24, Bureau of Plant Industry—"Alfalfa in Cultivated Rows for Seed Production in Semi-Arid Regions." The details are also largely applicable to the growth of lucerne for hay.

The principles are to prepare the ground carefully, conserving moisture by fallowing if necessary, and providing a fine, moist seed-bed. The lucerne seed is then sown in drills about 3 feet apart. This can be done with a wheat-drill by stopping up all holes except those from which it is desired to sow lucerne. Satisfactory results have been obtained by setting the drill to sow 12 lb. per acre with all the holes in operation. With four out of five holes stopped, approximately $2\frac{2}{5}$ lb. of seed per acre will be sown.

Chopped corn or burnt millet seed may be mixed with the lucerne if the drill will not sow slowly enough. If desired, the plants can be thinned out in the rows by cross-harrowing when they are all up. There should be from four to ten plants to the running foot.

The best distance apart to place the rows should be governed by the implements to be used for cultivation, and also by the size of the mower. The mower should cut two rows at once. If the rows are 3 feet apart, a 6-foot mower will be found advisable.

Mr. Louis Brott, of Saxtorp, Cheyenne County, Nebraska, has rows half a mile long. The American authorities recommend this method of growing lucerne in districts where the average rainfall ranges from 14 to 20 inches. It should be worth a trial in our wheat and sheep country.

A Rule for Feeding Cows.

Each cow should receive as much roughage as she will eat up clean, and a portion of this should preferably be of a succulent nature, like grass, silage, soiling crops, or roots. Of concentrates, it has been found a good working rule to feed as many pounds of grain feeds per day to each cow as she produces pounds of butter fat a week, or one-fourth to one-third as much grain as she gives pounds of milk daily, the amount depending upon the percentage of butter fat in the milk. In the case of cows producing milk with a low percentage of fat, one-fourth would be required. Care should always be taken to avoid an increase in body-weight above the normal for each cow, since the milk secretion, as a general rule, is likely to suffer when cows commence to utilise their feed for the formation of body-fat.—Bulletin 200, Wisconsin Experiment Station.

Corn Silage for Winter Feeding of Ewes and Young Lambs.

During the past three years, experiments have been conducted at Purdue University, Indiana, U.S.A., to determine the value of corn silage as part of the winter ration for pregnant ewes, ewes with lamb at foot, and newly weaned lambs. It is now generally recognised that succulence is one of the most important elements in the winter ration of the breeding ewe. The objects of the experiments were to ascertain how far corn silage could be used with advantage, what quantities would be required to replace other feeds, its effect upon the milking qualities of the ewes, development of lambs, &c.

All the ewes and lambs were fed grain, and to test the different roughages, they weie divided into lots, fed mixed hay and corn silage, mixed hay and corn stover, clover hay, and clover hay and corn silage. The results are given in Bulletin 147 of the Purdue Station, where gains in weight, quantities of grain and roughage consumed, &c., are set out in detail. The general conclusions drawn are :—

> Good corn silage is an extremely palatable feed, and a desirable form of succulence for the winter feeding of both ewes and young lambs.
>
> Experience in the use of corn silage would indicate that it has a desirable effect upon the digestive system, and benefits the general health and thrift of breeding ewes in the winter.
>
> Of the fall lambs, sold as "hothouse lambs" during the spring of 1909, those receiving the silage ration showed a slightly fatter condition of the carcase that those receiving the dry rations.
>
> In the spring of 1907, after the close of the year's experiments, four lambs died from eating spoiled or decomposed silage. The decomposition of the silage was favoured by exposure to the air in warm weather, and the low condition of the silo. It appears to be dangerous to feed silage in the warm late spring.

Black Oats.

Mr. G. H. Dunn, of "Dunreath," Nemingha, suggests that farmers troubled by black oats should, in addition to other steps recommended in the *Agricultural Gazette,* burn their stubble immediately the crop is off, and before stock have trampled the oat seeds into the dust. The reason is, that even where the seeds of the oat are not destroyed by the heat, the fine hairs, which are such an obstacle to their early germination, will be burnt off. If possible, it is best to burn against the wind, as the heat is then more intense and longer continued. The recommendations of the Department as to making a fine tilth should then be carried out, after the early burning of stubble.

Many who have now to tackle the oat pest with their coats off, will thank Mr. Dunn for this additional point.

Spraying Potatoes.

A. J. PINN, Assistant Inspector of Agriculture.

In order to determine the efficacy of spraying potatoes with Bordeaux mixture, several experiments have been carried out by the Department during the past season. The one which attracted most interest was carried out on Mr. J. Pilgrim's farm in the Hunter River Valley at Bolwarra. This plot was situated on the main road, and, as there are no fences in the locality, it afforded every opportunity for observation by everyone who passed.

The previous crop grown on the sprayed area was also potatoes, which were diseased. The adjoining plot, belonging to another farmer, also contained potatoes, but had not been under this crop for many years. It will be seen that the experiment resolved itself into a trial in which the conditions of the test plot were favourable to the development of the disease, whereas the conditions up to the time of planting of the check plot were all that could be desired to procure a healthy crop.

The area sprayed in this experiment was 4 acres. The variety used was a type of Early Rose called Early Ohio, which is very susceptible to attack by blight. The seed was selected from the progeny of potatoes taken from a diseased crop.

The first spraying was given on 6th March, 1911, when the potatoes were about 9 inches high. Light rain set in on the 7th and continued up to the 10th, when a fall of 1 inch came in half-an-hour. Two inches were received in three-quarters of an hour on the 11th. The result of this rain was that it was impossible to get on the ground until the 16th March, when the second application was given.

On the 17th, blight made its appearance in the untreated crop, and during the following day appeared all over the district. During this epidemic the plants were growing very fast, and it was necessary to spray at short intervals to prevent attack. Subsequent applications took place on the 21st and 28th March and the 5th April. A further spraying should have been given about the 13th April, but, as the machine was at another farm and temporarily disabled, this application was not made. The portion of the plot that was sown with cut seed, and which was planted early in the season, ripened earlier, but the remainder of the plot was fairly green, and would have benefited by an application on the date mentioned.

Mr. Pilgrim wrote on 16th May giving the yields as follow:—

Early plot, 2 tons 10 cwt. per acre, with 5 per cent. bad.
Late plot, 2 tons 15 cwt. per acre, with 20 per cent. bad.
Untreated plot, 7½ cwt. per acre.

Another area on this farm, planted with Red Ruby variety, received two sprayings only, and yielded 2 tons 12 cwt. per acre, all sound. This variety proved a better resister of blight during the outbreak of the previous season.

The sprayed area was considered by all who saw it to be the best crop in the district, and visitors from some of our chief potato-growing centres on the tablelands were so convinced of the success of spraying that they stated their determination to secure machines for their own use.

During the season, five applications of Bordeaux mixture were given, the first two being of the 4–4–40 formula, and the three last of the 6–6–50 formula. The machine used was a "Fleming," capable of spraying 15 acres per day, applying the mixture at the rate of 80 gallons per acre in each application. The total ingredients used per acre for the five sprayings were 45 lb. bluestone, 45 lb. lime, and 400 gallons of water. The local quotation for bluestone was 28s. per cwt., and for lime 5s. per bag. This makes the total cost for material:—

	s.	d.
45 lb. bluestone, at 3d.	11	3
45 lb. lime, at $\frac{1}{4}$d.	0	$11\frac{1}{4}$
	12	$2\frac{1}{4}$

As the lowest yield on the sprayed area was 2 tons in excess of the unsprayed area, it will be seen that a considerable profit was made over the cost of both labour and material. The farmer drove the machine, and his son made up the mixture for the next load. By this arrangement the machine was kept constantly at work. The area that can be sprayed per day will depend on the water supply and the distance the mixture has to be carted to the field.

Seeing the good results of spraying on Mr. Pilgrim's farm, Mr. Bolt, a neighbouring farmer, asked that his crop be sprayed. On inspection before spraying the potatoes were found to be already infected, but it was decided to spray to determine whether any good results would ensue. Two sprayings were given, but did not prevent the destruction of the tops, although Mr. Bolt was of the opinion that the spraying was of great benefit in preventing subsequent rot. This confirms the advice given by the Department that spraying must be commenced before any infection takes place, and is only of use as a preventive.

Further tests were carried out on some of the later crops on the holdings of Messrs. Paterson and Lightfoot. On Mr. Lightfoot's farm the blight was showing in a slight form, but at Mr. Paterson's one young crop was free from disease. The first spray was applied to Mr. Paterson's crop on the 7th April, and to Mr. Lightfoot's on the 8th and 12th April.

I visited these plots on the 1st May, after the third application had been given. At that time Mr. Paterson's crop looked very healthy, but at Mr. Lightfoot's, where spraying was commenced a little late, the appearance was not quite so good. Both growers stated that they were convinced from the

results obtained that spraying is beneficial and necessary for the successful cultivation of potatoes, and felt certain that without spraying the crops would practically have failed.

Mr. Lightfoot's crop averaged about 2 tons per acre, with ½ cwt. blight-infected. Mr. Paterson reported that his potatoes yielded about 1 ton per acre, the smallness of the yield being due partly to the lateness of planting (the potatoes not having been sown until the second week in March), and partly to a dry spell which followed. The total amount of rot in the whole crop did not exceed 10 lb.

Another experiment was carried out on the Government Experiment Farm at Glen Innes. It will be remembered that the season was a very wet one, and favourable to the rapid spread of the disease. The machine did not arrive until the wet season had set in, and it was impossible to get on the soil until 17th December, on which date the first spray was applied. Two later applications only were made, viz., on the 23rd December and 20th February. The formula used was copper sulphate (bluestone), 6 lb.; lime, 5 lb.; water, 50 gallons.

On the night following the first spray a heavy thunderstorm washed the bulk of the spray off. Blight made its appearance on 12th February. The difference in appearance between the sprayed and unsprayed plots was very marked. The leaves of the unsprayed plots quickly turned black, and the stems soon died, whereas the sprayed plots remained green for about three weeks later, the leaves only being slightly affected. The whole of the potatoes on the farm were sprayed, except an area of Brownell's Beauty, which was used as a check. The yields per acre of the plots were as follow:—

	tons	cwt.	qrs.	lb.
Sprayed	3	5	3	9
Unsprayed	2	11	0	23
Difference in favour of sprayed plot	0	14	2	14

From what has been written, it will be seen that not only is spraying efficacious, but it is a payable operation. For the information of those who propose spraying their crops this season, the following instructions are given:—

Spraying Machines.

When selecting a spraying machine, see that the pump is specially constructed for the use of Bordeaux mixture, *i.e.*, lined with metal, such as brass, gun-metal, &c., which is not corroded by the solution.

Select a machine in accordance with the area grown. If a large area is cultivated, say from 30 acres upwards, it will be necessary to obtain a horse power machine; for a smaller area, a pump which could be mounted on a dray would answer the purpose. Of course, where this latter class of machine is used, it will be necessary to engage an extra hand to do the pumping, and the potatoes will have to be planted at such a distance apart, that the wheels of the dray will come between the rows through which they travel.

Our experience with horse power machines has been confined to the "Fleming"; this machine having proved very satisfactory. The cost is about £35 f.o.r., Sydney. To treat smaller areas, the Department has secured a "Strawson" hand-power spraying outfit, the cost of which is about £18 f.o.r, Melbourne.

The Fleming Potato Sprayer at Work.

The demand for machines has been so great during the year that agents have, in some cases, increased the price £5 and £6 per machine, and difficulty will be experienced in getting them even at the higher price later in the season. Smaller growers are advised to buy the various parts, and construct the machines themselves. A machine of this class, capable of spraying four rows at a time, was described by the Manager of the Grafton Farm in the January, 1910, issue of the *Agricultural Gazette*. The various costs were given as follows:—

	£	s.	d.
One spray pump	5	7	6
One 100-gallon vat, with lid and galvanized-iron hoops ..	2	18	4
12 feet $\frac{3}{4}$-inch hose, at $9\frac{1}{2}$d.	0	9	6
20 feet $\frac{1}{2}$-inch hose, at 8d.	0	13	4
Two Y pieces, at 5s.	0	10	0
Six caps and lining, at 1s.	0	6	0
Four single-spray nozzles, at 4s. 6d.	0	18	0
Two brackets, at 2s. 6d.	0	5	0
Four clamps, at 1s. 6d.	0	6	0
Extra :—Four single-spray nozzles, at 4s. 6d....	0	18	0
	£12	11	8

Many opinions have been expressed regarding co-operation in the purchase of spraying machines. Whilst recognising the good results often accruing from co-operation, I consider that the system, if applied to spraying machines, would, except under very favourable conditions, prove unsatisfactory. Success would not follow, unless the farmers' holdings were small, and adjoining one another, and the number of shareholders would need to be limited to about two or three. It must be remembered that the delay of a day or two, especially after rain, may mean total ruin, and the whole area belonging to the growers must necessarily be sprayed within a few days, or the loss may be considerable.

With Codlin Moth, the orchard which is not sprayed is a source of infection to the surrounding ones. In the same way the unsprayed potato field is a danger to the district in which it is situated. Farmers should therefore take all possible precautions, not only for their own sakes, but also for the sake of their neighbours.

Although the method of preparing Bordeaux mixture has been written up from time to time in the *Gazette*, it will not be out of place to repeat the instructions as applying to potato spraying. These are taken largely from *Farmers' Bulletin*, No. 31—"Certain Fungoid Diseases of Potatoes (including Irish Blight)," by Drs. Tidswell and Johnston.

How to Prepare Bordeaux Mixture.

Formula:—	Copper Sulphate (bluestone) ...	4 lb.
	Lime	4 „
	Water	40 gallons.

Copper Solution.

As the mixtures have to be made in quick succession, it will be necessary to use boiling water to dissolve the bluestone. The bluestone should be suspended in a porous bag (muslin or hessian) and kept moving in the water By this method it will dissolve in a few minutes. Only a few gallons of boiling water would be required to dissolve the bluestone, but the solution should be considerably diluted with cold water before the mixing takes place.

If the bluestone is thrown into the vessel and the water poured on to it, a very long time is necessary before it dissolves.

Lime.

The lime, which should be freshly burnt, is slacked with a small quantity of water. Hot water may be used, often with advantage, especially at the outset. The lime, if it is good, should become hot, crack asunder, give off a quantity of steam, and finally crumble into a fine white powder. Slacking on a board is to be recommended rather than in a cask, because if the lime is really freshly burnt there will be considerable heat evolved, and the barrel may suffer. When slacked it should be emptied into the barrel and water added.

Mixing.

The best method of mixing is to run the bluestone solution and the lime solution evenly into a third vessel. In order to do this, it is better to have

three barrels, two to be on a platform so that they are higher than the third, which is the largest barrel. The two vessels on the platform should have a hole bored near the bottom and stopped with a wooden plug. These barrels should contain the bluestone and lime solutions. The plugs should be drawn out together, so that the two streams join when entering the largest vessel. This should be covered with a fine sieve to keep out impurities which might block the nozzles.

As there are usually some lumps left in the lime solution, it is best to bore the hole in the lime cask a little higher so as to drain off only the milk of lime above the lumps.

The next best method is to pour the solution of milk of lime into the copper solution.

It is far better to mix the two solutions in a dilute form than to mix when concentrated and afterwards dilute them. The milk of lime should be added very gradually to the copper sulphate solution, and the resulting mixture should be constantly agitated. The superiority of the properly made mixture was shown clearly by Mr. D. McAlpine, Vegetable Pathologist of the Victorian Government, some years ago. In this *Gazette* for November, 1903, page 1070, Dr. Cobb gives a picture of Mr. McAlpine's test cylinders, showing the amount of sediment thrown down under various methods of mixing. The mixture in which the sediment remains in suspension longest is, of course, the best. The particles are in a finer state of subdivision, and hence will work through the spray nozzle freely, and act more efficiently when applied to the plants.

The proportions of the Ingredients.

The proportions above given provide ample lime to more than neutralise all the copper sulphate; in fact, there is more than twice the quantity required to convert the copper into the hydrate, provided, firstly, that the lime is pure; secondly, that it is freshly burnt; and thirdly, that the lime is really all made into wash.

With regard to the latter point, instructions are often disregarded, and in many cases not more than a quarter or half the quantity of lime recommended becomes finally combined with the copper.

If, in addition to this, the lime is not pure, and has been burnt some time before being used, it may quite easily happen that, instead of the above quantities of lime being in excess of what is required, they may be altogether insufficient for the purpose, and that the solution may contain free copper sulphate. Assuming that free copper sulphate, even in small quantities, does "burn" the foliage, and that it is undesirable to have any in the mixture on this account, it appears preferable to have no fixed quantity of lime, but simply to have a definite quantity of copper, and to add the lime until the copper is neutralised.

In order to know when the copper sulphate is neutralised, the readiest test is ferrocyanide of potassium; but it is important to remember that at a certain point ferrocyanide ceases to give the characteristic coloration (in such a solution as we are dealing with), although there is still unaltered copper

sulphate in solution. In other words, the solution may contain free sulphate of copper, although the ferrocyanide test, applied as directed, does not show it. Therefore it is important to remember that the mixture is not ready for use when ferrocyanide no longer gives a red colour, but that a quantity more lime (even half as much again) must be added.

Instead of ferrocyanide, a rough test to show when sufficient lime has been added consists in placing a clean knife-blade in the mixture for a few minutes If there is no red stain on the knife-blade, the copper solution is neutralised.

Vessels employed.

For the copper solution, wooden vessels are preferable, though copper vessels may be used. Iron vessels must not be used. For the lime, use wooden tubs or barrels. Do not leave the mixture in the spray-pump, as it will slowly attack the copper; but when the spray is finished, pour it away and wash the pump and hose well with water.

Purity of Ingredients.

Samples of "bluestone" are often received which contain a quantity of sulphate of iron. The following hints will enable anyone to detect such a compound. Bluestone should be in the form of dark blue crystals (the adulterated mixture referred to is light blue, like sulphate of iron). They dissolve completely in water—readily and completely in hot water or water to which any acid is added.

In order to test its purity still further, add ammonia. A pale blue precipitate is formed, which dissolves to an intense blue colour. This solution should be perfectly clear, and leave no sediment on standing. If a reddish sediment settles, it is due to the presence of iron.

Lime.

The best freshly-burnt stone lime only should be used. To test it, place a few lumps in a small heap and sprinkle with water. The water should be absorbed by the lime, when the latter gradually falls to pieces, becoming very hot in the process, and giving off a quantity of steam. It gradually crumbles to a fine, white powder. If it does not get hot enough to give off steam, it has not been freshly burnt.

How often to Spray.

The number of applications to be given will depend on the season. The first application should be given when the plants are about 6 inches high. It will then be necessary to watch the crop closely, and should heavy rain wash the mixture off a further application must be made as soon as the ground is dry enough to work. For best results it is imperative that the plants be kept well covered with fungicide throughout the season. During epidemics, and periods of rapid growth of the tops, it may be necessary to spray as often as once a week. It is recommended that the early sprayings be of the 4–4–40 formula, but this should be increased to 6–6–50 when blight begins to show in the district, and should be continued at that proportion until the end.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 107. *Dichelachne brachyathera*, Stapf.

Botanical Name.—*Dichelachne,* Greek, *dis,* double; *cheilos,* a lip; *achne,* chaff (glumes), the flowering glumes being two-lobed; *brachyathera, brachus,* short; *athera, ather, atheris,* the point of a spike, in allusion to the comparatively short awns.

Botanical Description.—A glabrous, perennial, cæspitose grass, with slender stems of 4 nodes, the internodes exserted from the sheath.

Leaf-sheath dilated at the top, more or less scabrous; ligula membranous, broad-ovate, 3 mm. long; lamina linear, narrowed to an acuminate point, the lower ones 35 cm. long and 7 mm. broad, flat, scabrous, the lateral secondary nerves, 3 on each side.

Panicle contracted, linear, 15 cm. long and a little beyond a cm. in diameter, the lower internodes 3 to 2 cm. distant; branches clustered, very unequal, the longer ones undivided in the lower part, the short ones divided from the base; secondary branches also clustered, racemose, pedicels 1·5 to ·5 mm. long.

Spikelets lanceolate, 4 to 5 mm. long, greenish.

Outer glumes narrow-lanceolate, acutely acuminate, whitish and membranous towards the margins, the keel scabrous, the lower one somewhat shorter and 1-nerved, the upper one 3-nerved.

Flowering glume lanceolate, very acute, minutely bifid, about equal in length, with the upper outer glume awned about 1 mm. below the apex, very slightly scabrous, 5-nerved, the outer nerves nearly marginal, slightly bearded at the callous base; awn 4 to 5 mm. long, somewhat flexuous, and more or less recurved in the middle.

Palea thin, 2·5 to 3 mm. long.

Anthers broad-oblong, ·5 to ·7 mm. long.

Stigma delicately plumose, 1 to 1·5 mm. long.

Mt. Wilson, swamp at the head of Waterfall Gully.—J. GREGSON. March, 1906.

The new species is allied to *Dichelachne sciurea,* Hook., f., but differs from it by the smaller spikelets, the more unequal outer glumes, the much shorter awns, and the short anthers. (Otto Stapf in *Kew Bulletin,* 1906, p. 203.)

Fodder Value.—It is a tallish grass. Dr. Stapf does not give its size, but we have a specimen in the National Herbarium 4 feet high, and doubtless it attains an even larger size. No specific information is available as to its fodder value, but there is no doubt that it is the same as the other *Dichelachnes* (*sciurea* and *crinita*). In other words, it is doubtless a useful grass for stock, producing a moderate amount of feed from its young leaves, which seems to be acceptable to stock, but it does not seem to possess conspicuous merits.

Habitat.—Its specific identity has only recently been settled, and it has only been found in one spot, viz., in a swamp at the head of Waterfall Gully, Mount Wilson, Blue Mountains, N.S.W., by Mr. Jesse Gregson, by whom it was forwarded to the National Herbarium of New South Wales It is not likely to be of limited range, and is to be looked for in moist areas, or in sandstone country generally. It is probable that in drier situations it may be found to occur in less luxuriant forms.

EXPLANATION OF PLATE.

A. Entire plant, except the upper part of the stem, with the inflorescence cut off.
B. Upper part of the stem with the inflorescence.
C. A single spikelet, showing the two outer glumes and the flowering glumes.
D. Flowering glumes with palea.
E. Grain, from the back, and from inside.

SUMMER FODDER CROPS AT FROGMORE.

IN a paper read before the Forest Creek branch of the Agricultural Bureau, Mr. Thos. B. Prosser gave results of a series of trials made by him to find a fodder crop or cultivated grass that would give a fair return for the money and labour expended, and be fit to cut or feed-off during the summer, when lambs are being weaned. The crops tried were Maize (several varieties), Hungarian Millet, Pearl Millet, Broom Millet, Japanese Millet, Cowpeas (three varieties), Turnips, Swedes, Sorghum (Planter's Friend, Early Amber Cane, and Kaffir Corn), Johnston Grass, Sheep's Burnet, Crimson Clover, Scarlet Clover, and Sainfoin.

The best results were obtained from Golden King Maize, which proved very drought-resistant; but it is a slow maturer, and often reaches the proper feeding stage too late for weaning lambs. Other maizes were not so good.

The millets were too coarse. The sorghums and cowpeas did not yield much fodder. Johnston grass, growing on poor, sandy soil, is doing well after eleven years; but Mr. Prosser does not recommend it for good land, as the fodder is not first-class, and it is difficult to eradicate. Sheep's Burnet and Sainfoin did not produce heavy crops, but kept green all the year, and always shot up in favourable weather.

Mr. Prosser considers lucerne the most valuable fodder plant for those who have suitable ground; for others, the drought-resisting varieties of maize. But he does not say whether he has made any experiments with lucerne.

In another trial, to determine the value of feeding young sheep for wool, Mr. Prosser fed 150 lambs on 20 acres of rape and 150 on natural pastures, from July to October. About 20th October both lots were shorn The grass-fed lambs gave 8 lb. wool; the rape-fed ones 11 lb. The difference, 3 lb. per sheep, was worth 1s. 9d., and the return on cultivation of rape about 13s. 1½d. per acre. This was in a "bumper" season; in a dry season the difference would be greater. He also estimated the difference in value of the sheep off shears at about 1s. to 1s. 6d. per head.

DICHELACHNE BRACHYATHERA, Stapf.

Onions at Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

UPON the uplands of this Farm, onions were grown for eight years to test their suitability as a field crop. The conditions generally proved too dry for profitable yields. The following are the yields :—

1902. Rainfall—14·83 inches.

Variety.	Yield per acre.		
	tons	cwt.	qrs.
James' Keeping	1	13	0
Early Flat Red	1	12	2
Brown Spanish	1	9	1
Market Model	1	9	0
Brown Globe	1	7	0
Queen Pickling	1	2	3

Giant Rocca and Mammoth Silver Skin were much later than the others, did not ripen satisfactorily, and were not estimated. Owing to dry weather, seedlings were watered twice.

1903. Rainfall—21·69 inches.

Variety.	Yield per acre.		
	tons	cwt.	qrs.
Giant Rocca	5	17	0
Yates' Selected Long Keeping	4	16	0
Market Model...	4	14	0
Large Flat Red	4	8	3
Brown Globe	4	7	1
Brown Spanish	4	5	3
James' Keeping	3	7	2
Barletta...	2	15	3
Yellow Globe	2	2	0

Giant Rocca and Barletta are not good keepers, and are undesirable.

1904. Rainfall—18·26 inches.

Variety.	Yield per acre.		
	tons	cwt.	lb.
Yates' Keeping	1	16	2
Market Model	1	16	2
Brown Spanish	1	10	3
Brown Globe	1	4	3
James' Keeping	1	2	3
Yellow Globe	0	16	3
Average yield	1	10	0

The yields were affected by dry weather.

1905. Rainfall—18·57 inches.

The onions were planted too late, and did not ripen properly.

1906. Rainfall—22·89 inches.

Variety.	Yield per acre.			
	tons	cwt.	qrs.	lb.
Yates' Long Keeping	2	15	3	14
Brown Spanish	1	18	1	18
James' Long Keeping	2	4	0	5

1907. Rainfall—19·72 inches.

Variety.	Yield per acre.			
	tons	cwt.	qrs.	lb.
Yates' Keeping	3	12	2	0
Early Yellow Globe	3	10	1	20
Brown Globe	4	0	3	4
Brown Spanish	2	19	0	4
James' Long Keeping	3	6	1	4

1908. Rainfall—15·89 inches.

In this year onions were practically a failure, and did not ripen satisfactorily; they shot out again after rains in January. Only some of the Brown Spanish ripened.

Varieties grown.—Brown Spanish, Brown Globe, and James' Keeping.

1909. Rainfall—21·96 inches.

Variety.	Yield per acre.		
	tons	cwt.	lb.
Yates' Keeping	4	8	0
Brown Globe	3	3	0
James' Keeping	4	3	0
Brown Spanish	3	18	0

Method of Culture.

The practice followed was to sow the seed in beds in March, and transplant the seedlings out during June and July in rows 15 inches apart and 9 inches between the plants. The estimated cost of transplanting was £2 5s. per acre.

By this method germination could be ensured by watering the seed-beds. The land was kept free from weeds, and the seedlings were transplanted upon freshly-ploughed soil. The seedlings were cut back at planting. They were ready to harvest during January.

Upon the irrigation area of the Farm very satisfactory crops were returned. The estimated yields from the most suitable varieties ranged from 4 tons to 9 tons 17 cwt. per acre.

The most suitable varieties from a keeping point of view were Brown Spanish and James' Keeping.

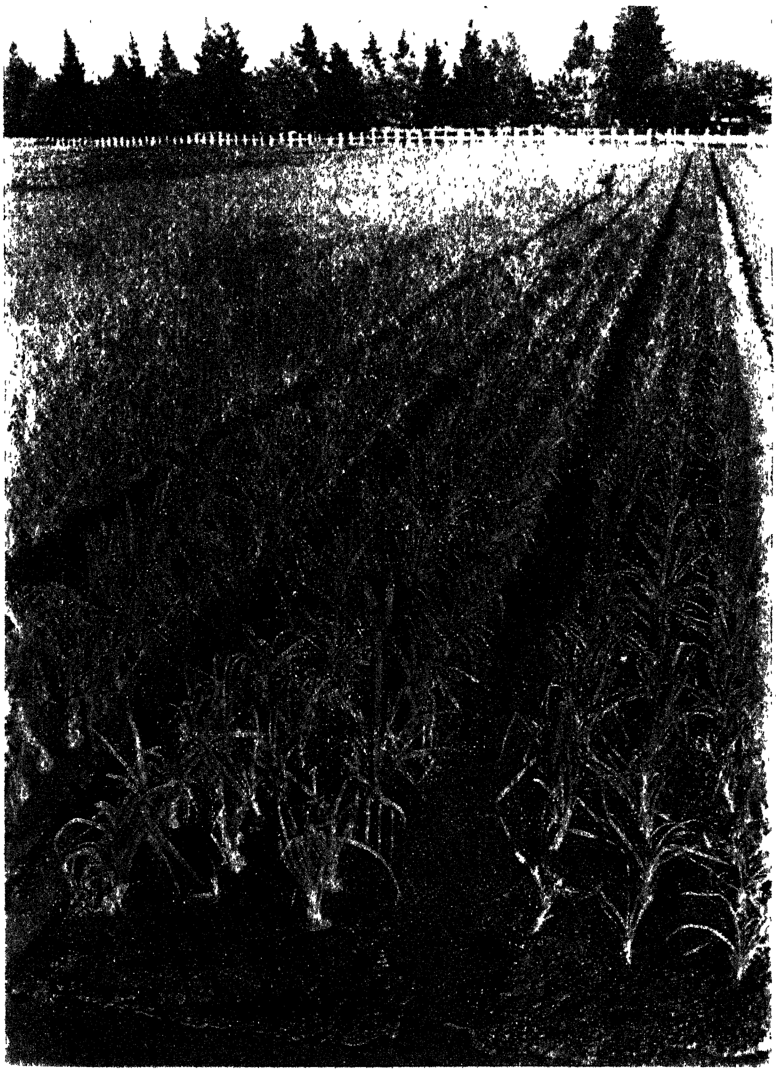
Onion from Portugal.

A variety from Portugal was tested against Brown Spanish and Yates' Selected Long Keeping Brown Spanish, under irrigation, during 1910. The results were published in May, 1911, *Gazette*, page 440. The onion from Portugal is large and soft, and does not keep as well as Brown Spanish.

Remarks.

From the above it will be seen that onion-growing upon the uplands was not profitable, except during the best seasons. Yields from 4 to 5 tons were only obtained during two years out of eight.

Upon the return of good seasons, it is reasonable to assume that profitable crops could be grown.



Irrigating Onions, Irrigation Area, Bathurst Experiment Farm.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Green Manures.—If the green crop has not been turned under, this should be done as early as possible, in order that the crop may become well rotted while there is still plenty of moisture in the soil. If such crops are allowed to remain in until the land becomes dry, it will be found almost impossible to plough it, to say nothing of turning them under; and the chances are that, instead of doing good, the opposite effect will result. The moisture, in place of being conserved, will have been taken up by the crop, in consequence of which the soil will have become hardened. When ploughing is attempted, the ground will break apart in lumps, and it will be found impossible to turn the crop under, which will thus dry up instead of rotting, as it should.

Spraying.—If the spring proves to be a wet one, it is advisable to spray trees which have in previous years shown signs of fungous diseases, such as peach curl in the peach trees, black spot or scab of the apple, and shot-hole fungus of the apricot. Bordeaux mixture and lime-sulphur will be found the best sprays at this time of the year for all fungous diseases.

San José Scale.—Should the San José scale put in an appearance after the leaves have started on the trees, the resin, soda, and fish-oil wash will be found the best to use at this season of the year; yet it may damage the fruit a little, unless applied very weak or immediately the fruit has been harvested.

When Not to Spray.—Never spray any trees or vines when they are in bloom, as the chances are that the crops will be destroyed. They may be sprayed a week before coming into bloom, and a week after the fruit is set.

Cultivation.—In all cases, see that the orchard is in thorough condition, as the future crop depends so much on the state in which the trees and soil are kept during the summer months.

Codlin Moth.—It is well to make early arrangements for fighting the codlin moth. It has been proved that four applications of arsenate of lead will control this serious pest. The first spraying should be given just as most of the petals have fallen. This is the most important spraying of the four. The quantity used is 4 lb. to 100 gallons of water. The second spraying should follow a fortnight to three weeks after the first, using 3 lb. of arsenate of lead to 100 gallons of water. Subsequent sprayings may be given at intervals of every three or four weeks, if the moth is bad, using 3 lb. of arsenate of lead to 100 gallons of water. In spraying trees with this, or any other spray, see that a good pressure is kept up, so that the pump will throw a fine mist, and be particular to cover the inside and outside of the tree as well as the whole of the fruit.

Late Planting.—It is rather late for planting deciduous trees, even during the earlier part of the month; yet, if they are given special care, such trees and vines may be planted. Careless handling is usually responsible for loss.

All soil should be loosened, either with a fork hoe or chipping hoe, around trees and vines, and all couch grass, sorrel, or other weeds removed and burnt. This work should be carried out in the early spring, while the soil is moist and easy to work.

Late Pruning.—In some districts pruning may not be finished by the beginning of the month; but the work should be completed before the middle of September, if possible.

Weevils in Dried Fruits.

Specimens of dried currants were recently forwarded to the Department infested with weevils. The Government Entomologist reports that the weevil is the Saw-toothed Grain Beetle (*Silvanus surinamensis*), a very common cosmopolitan insect attacking all kinds of dried fruits, &c. The fruit is usually affected during the process of drying, and the beetles come from the eggs which have been laid at that time. The Entomologist adds :—

> Currants infested might be treated with bisulphide of carbon, a liquid that produces fumes deadly to all insect life. If the currants were afterwards spread out, all the smell and fumes would disappear. One pound of bisulphide will treat 100 bushels of wheat in an air-tight compartment (a malt-tank is often used). A building infested could be fumigated with bisulphide of carbon, or closed up and charged with hydrocyanic acid

Fumigation of Citrus Trees in California.

In Southern California, spraying citrus trees to check scale has now almost entirely given way to fumigation. In 1907, Mr. R. S. Wolgum, M.S.A., was appointed a Special Field Agent of the United States Department of Agriculture, to investigate fumigation practice in California, and he has now issued the results of his three years' work as Bulletin No. 90, Bureau of Entomology, U.S. Department of Agriculture. This is really a text-book on fumigation, well illustrated, and citrus-growers are recommended to obtain a copy from Washington.

Collar Rot, or Mal di Goma, in Citrus Trees.

Mr. Fruit-Inspector O. Brooks, of Gosford, has found carbolic acid and Stockholm tar very effective against Collar Rot (Mal di Goma). All diseased bark and wood are cut away, and the cut surface smeared with the mixture. The usual proportions are one-third carbolic acid and two-thirds Stockholm tar; but Mr. Brooks has mixed them in equal proportions.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Bathurst	Mr. S. McKibbin, O'Connell.
Bonville	Mr. H. B. Faviell, Bonville.
Carlingford..	Mr. D K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown... .. .	Mr. S. A. Levick, Roseneath, Cundletown.
Frogmore	Mr. W. Thompson, Forest Creek, Frogmore.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Little Plain...	Mr. H. C. Stening, Little Plain, *viâ* Inverell.
Milbrulong	Mr. O. Ludwig.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Yass...	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

The list above enumerates the places at which branches have already been formed. The members are receiving the advantage of courses of lectures

by Departmental experts on subjects which are of interest to them. Every reader of the *Agricultural Gazette* should join the local branch, or arrange to have one formed in his district. He cannot afford to let go by him such an opportunity of acquiring up-to-date information of modern methods in regard to his business. If a branch of the Bureau does not exist in his neighbourhood, he should write to the Department, and steps will be taken to form one.

Bathurst.

Mr. Peacock, the manager of the Bathurst Experiment Farm, recently lectured on "South Australian Dry Farming" to the members A pruning demonstration was given on 3rd August. A lecture by a Departmental veterinary surgeon was given on the evening of the 15th August, in the Technical College Hall, Bathurst, at 8 p.m , on "Horses."

Bonville.

At a public meeting held at Bonville on 20th July, it was resolved to form a branch of the Agricultural Bureau, and Mr. H. B. Faviell was appointed hon. secretary. Those wishing to join should communicate with Mr. Faviell.

Arrangements are being made for Mr. Inspector Marks to lecture in September.

Carlingford.

Mr. Bradshaw, Poultry Expert, delivered a lantern lecture to the members of the Carlingford branch on 12th August. Despite the wet night there was a fair attendance.

Frogmore.

Mr. Bryant, Assistant Fruit Expert, gave a pruning demonstration on 19th August.

Inverell.

On the 14th July, Mr. A. H. E. McDonald, Inspector of Agriculture, gave a lantern lecture.

Messrs. James Hunt and W. J. Keary have joined the Bureau.

A lantern lecture on "The Conformation and Unsoundness of Horses" was given on 14th August.

Katoomba.

The following officers have been elected :—Chairman, Mr. M. Ward ; Vice-Chairman, Mr. A. Summergreen ; Hon. Treasurer, Mr E. K. Hudson ; Hon. Secretary, Mr. C. Wooller, Oliva Park Farm, Katoomba.

The membership now stands at twenty-two, and the Bureau gives promise of doing useful educational work amongst the dairymen, fruit-growers and vegetable gardeners on the Mountains, Megalong Valley, and district.

The Dairy Expert, Mr. M. A. O'Callaghan, was to have delivered a lecture on the 31st August.

Milbrulong.

A new series of lectures is being arranged by the Sheep and Wool Expert, and Milbrulong will be included amongst the places where they are to be delivered. Arrangements are also being made for an early lecture on a veterinary subject.

Nelson's Plains.

Mr. Veterinary Surgeon Massy delivered a lecture to the members on the 24th July, on "Colic and Strangles in Horses." Unfortunately, the night was wet, and the attendance was therefore poor.

Arrangements are being made for Mr. Dairy Instructor Pedersen to lecture on "The Advantages of Herd-testing Associations."

Orchard Hills.

Mr. Turner, the Chairman of the Branch, read an interesting paper on "Phylloxera" to the members.

Parkes

Mr. M. H. Reynolds, Inspector of Agriculture, is arranging to lecture at an early date.

Peak Hill.

Mr. Veterinary Surgeon Sanderson lectured on "Horses" on 11th July, and there were about twenty-five persons present.

Wagga.

Mr. Veterinary Surgeon Sanderson gave a lecture to the members of the Bureau at the Wagga Town Hall on 19th July. It was attended by a large and most appreciative audience, among whom were many members of the local Agricultural and Pastoral Association, the President of which occupied the chair.

Walli.

Mr. Mathews, Sheep and Wool Expert, gave his concluding lecture of the series on "Sheep and Wool" at Walli on the 10th August, before an interested audience. The practical advice given to individual members of the Bureau during Mr. Mathews' visits has been greatly appreciated, and should result in improved flocks in the district. A number of new members have joined, the membership now standing at thirty-nine.

Yass.

At the July meeting of this branch, Mr C. Ferris, Agricultural Expert at the local district school, gave an interesting and instructive address on "Soil Moisture," which was freely illustrated with diagrams and experiments. He illustrated the upward trend of moisture by films, and showed how, by constant tilth, moisture could be retained for the crop. The local press considered the lecture of sufficient importance to warrant giving it much prominence in their columns. The membership of this branch now stands at fifty-two, the new members being Messrs. S. Sleeman, C. Chambers, J. H. Cook, W. Lawrence, W. Huon, and F. W. Roche, jun. At the meeting held on 15th July at the Mechanics' Hall, Yass, a set of by-laws were passed, and as these may be useful for the guidance of other branches they are here given in full:—

YASS AGRICULTURAL BUREAU.

By-laws.

1. The Bureau shall be named as above, and shall form a branch of the Agricultural Bureau of New South Wales, with the head branch in the Department of Agriculture.
2. The objects shall be as stated in the circular.
3. All farmers, their sons, and others over school age may become members.
4. The annual suscription shall be 2s. 6d., dating from 1st March in each year.
5. The officers shall be:—Chairman, Vice-Chairman, Hon. Treasurer, Hon. Secretary, and Committee.
6. All political and religious discussions are debarred.
7. For business purposes, at least five members shall form a quorum.
8. The Bureau shall meet on third Saturday in each month, at 2·30 p.m., in Mechanics Hall, Yass.
9. The power of arrangement and management shall be in the hands of the Executive, and in cases of emergency shall be vested in the Hon. Secretary.
10. Only members shall have a voice in the management of the Bureau, but visitors may be invited to take part in the general business.
11. Motions relating to the management of the Bureau shall be given notice of at one meeting, to be dealt with at the next.
12. The business discussion shall as far as possible be conducted on the lines of a Parliamentary Debating Club.
13. The order of business at meetings shall be as follows:—
    (1) Reading and confirmation of minutes.
    (2) Correspondence.
    (3) Motions.
    (4) New members.
    (5) Other preliminary business.
    (6) Members' business.
    (7) General business and discussion.

The second of the wool lectures by Mr. Mathews, the Sheep and Wool Expert, was delivered on the 27th July, and the third on "Wool Classing," on 24th August.

In a paper read by Mr. F. W. Roche, Cavan, he stated he had practised leaving lambs' tails 3 or 4 inches long as a preventive of fly-pest. He also drafted ewe lambs from wethers after crutching with machines closely, giving as his reason the fact that urine round crutch of the ewe primarily collects and starts the pest. He suffered no loss from fly-pest among lambs last season.

A pruning, grafting and budding demonstration was given by Mr. Bryant, Assistant Fruit Expert, at the orchard of Mr. J. F. Turner, on 28th July.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

DRYING TOMATOES.—"T. W.": Take the fruit when fully ripe but firm, cut into thin slices, and drop into a light brine solution—say, 1 oz. salt to 1 quart water. After all the fruit is cut up, remove and place in an evaporator. Start with the temperature at 90 and work up to 120 degrees F. The fruit will be finished in about twenty-four hours. Of course, the drying can be carried out by placing the tomatoes in the sun after removal from the brine, but it will take much longer, and success or failure depends upon the weather conditions prevailing at the time. The salt solution is used merely to fix the colour, so as to preserve the appearance of the dried article.—GEO. VALDER.

GOSFORD DISTRICT.—"W. S." asks whether a man with a family could make a living on 40 acres of sandy loam, well-watered scrub lands, in Gosford District, and how?

There should be no difficulty; but, of course, much depends on the quality of the soil, which varies considerably. It is one of the best districts for a small mixed farm, as it lies between the two best markets, Sydney and Newcastle. The best results are generally obtained from fruit and vegetable growing. It is one of the best districts in the State for raising tomatoes. Pig, poultry and bee farming can also be successfully carried on. Coastal honey is not generally equal to that produced inland, but still it brings a fair price.—GEO. VALDER.

PROTECTING YOUNG FRUIT TREES FROM HARES OR RABBITS.—"A. L.": The most effective method is to enclose the area with wire netting. Another method, which has proved fairly effective, is to rub the trunk of the tree occasionally with a bullock's liver. This appears to be repulsive to rabbits and hares, as they do not care for anything that has a bad smell or taste.—W. J. ALLEN.

SULPHUR FOR MICE IN WHEAT.—"F. J. S." asks whether sulphur, sprinkled over bags of wheat when stacking, as a mice preventive, has any injurious effect on the wheat.

I have never heard that sulphur, sprinkled in the way mentioned, is injurious to the milling quality of wheat. Fumes of burning sulphur are highly injurious to both wheat and flour, as damage is done to the milling quality when wheat is fumigated by burning sulphur. I should not be inclined to think that sprinkled sulphur would have any bad effect on wheat.—F. B. GUTHRIE.

RAPE FOR LAMBS.—"M.," Cargo: Rape is a good fattening fodder for young lambs, but the best results are obtained by combining it with other fodders. February or March is the best time to sow it in that district. Sow broadcast 7 or 8 lb. per acre; or drilled 3 or 4 lb. The seed is obtainable from any Sydney seedsmen. It is usual to sow rape through the grass seed attachment behind the drill.—GEO. VALDER.

BEST CROSS-BRED SHEEP FOR THE MONARO.—"A. W. M.," Cooma: The most suitable ewe by which to raise the early lamb under average conditions prevailing in the Monaro district, is the Romney Marsh-Merino cross. Frequently Lincoln-Merino cross ewes and Leicester cross ewes are used for the purpose, but the Romney cross has been found to give the most satisfaction. After procuring the progeny of the first cross, in order to further accentuate the hardy constitution of the Romney Marsh, which makes it a more suitable breed for wetter and colder districts, the Romney ram should be again mated with the progeny. In order to guard against in-breeding and consequent degeneration, it would be wise to select a ram unrelated to the ewes.—J. WRENFORD MATHEWS.

RHODES GRASS.—"J. B. W.," Tamworth: Yes; Rhodes grass is a good hay grass. Two cuts may be obtained in a year, averaging from 10 to 15 cwt. per acre each cut. Fed green to dairy cattle, Rhodes has given results equal to the best grasses we have; but, of course, it is best if fed mixed with other grasses and fodder plants. From 2 to 3 lb. of seed should be sown per acre. It will grow well on black soil; but, as a rule, it does better on the higher and lighter soils. It generally gives best results if sown in the autumn. We do not advise sowing with a wheat crop in such a district, as often the young plants would not have made much headway by harvest time, and when the crop is cut, and they are exposed to the full heat of the summer sun, many of the young plants wither away. Like all drought-resisting grasses, Rhodes roots deeply, much depending, of course, upon the soil. In some cases its roots have been traced for several feet in depth. But, so far, reports indicate that there is little difficulty in ploughing out a crop of this grass.—GEO. VALDER.

Department of Agriculture,
Sydney, 2nd September, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

JERSEYS.—Patron: sire, Calceolaria's Lad; dam, Lady Pat; calved 27th September, 1910; colour (whole), dark fawn. Price, **£25.**

Lady Pat is from Pattibelle by Sir Jack. Pattibelle from Claribelle (imp.) by Lily's Boy (Vol. IX, p. 86, E.J.H.B.).

The Sphinx: sire, Calceolaria's Lad; dam, Sailor's Pride; calved 7th October, 1910; colour, fawn and white. Price, **£20.**

Sailor's Pride is from Egyptian Belle by Sir Jack. Egyptian Belle is from Egyptian Princess (imp.) by Tidy Punch, from Lady Tidy III, by Melbourne Punch.

***Blue Spec:** sire, Berry Melbourne; dam, Lally Optician; calved 29th July, 1909; colour, whole. Price, **£30.**

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.). Lally Optician is by Sir Jack from Bellona; Bellona by Optician (imp.) from Pattibelle (192, A.J.H.B.) Sir Jack is by Omelette's Pride from Lady Tidy III (imp.). Sir Jack realised 170 guineas at auction at Sydney Royal Show, 1910.

AYRSHIRES.—Drummond: sire, Auchenbrain Spicy Jock (imp.); dam, Juliette; calved 12th May, 1910; colour, brown and little white. Price, **£15.**

***Byron:** sire, Auchenbrain Spicy Jock (imp.); dam, Julia; calved 25th January, 1909; colour, brown and white. Price, **£20.**

Julia is by Peacemaker from Juliette. Juliette by Mischiefmaker of Barcheskie (imp.) from Judy IX of Barcheskie (imp.).

HOLSTEIN.—Kiel: sire, Hollander; dam, Lolkje Zuyder Zee; calved 22nd May, 1910; colour, black and white. Price, **£25.**

SHORTHORN.—Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

WOLLONGBAR EXPERIMENT FARM.

GUERNSEY.—Lord Hopetoun: sire, Parson's Hope; dam, Souvenir of Wollongbar; calved 24th October, 1910. Price, **£45.**

JERSEY.—Maro: sire, First Choice; dam, Marjory Newman; calved 27th August, 1910. Price, **£20.**

AYRSHIRES.—Cheviot's Chief: No. 243. Sire, Jamie's Ayr; dam, Cheva; calved 27th June, 1910; colour, white and brown Price, **£15.**

Lord Russell: sire, Lucky Getter (imp.); dam, Belladonna of Russelly; calved 18th June, 1910. Price, **£15.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

PURE-BRED RED POLL COWS for Sale, Grafton Experiment Farm.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£
Milkmaid ...	His Worship ...	Dairymaid II ...	6 July, 1905 ...	25
My Love	The Judge	Her Loveliness ...	19 March, 1904 ...	25

H. C. L. ANDERSON, Under Secretary.

*Applications for these bulls will be held till 21st September. If more than one application be received for any one bull his disposal will be decided by ballot.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy Duke ...	Earl March ...	Pansy 4th (imp.).	Wollongbar Farm	*
" ..	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	" "	*
" ...	March Pansy ...	Earl March ..	Australian Pansy.	Grafton Farm ...	*
" ...	Limerick Lad (imp.)	.. ..	....	Berry Farm ...	*
Jersey ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
" ..	Jamaica Jack ...	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
" ..	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ..	Berry Farm ..	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ..	*
Guernsey	Gentle Prince ...	Rose Prince (imp.)	Gentle (imp.).	Trevallyn	20 Dec., '11.
" ..	The King's Mirror.	Calm Prince ...	Vivid (imp.)...	Lismore	26 Nov., '11.
" ..	Star Prince ...	Calm Prince ...	Vivid (imp.)...	"	1 Jan., '12.
" ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	15 April, '12.
" ..	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	11 Jan., '12.
" ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Nov., '11.
" ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Grafton Farm ...	*
" ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" ..	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
" ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	Port Macquarie ...	20 Dec., '11.
" ..	The Peacemaker	Calm Prince ...	Rose Petersen	Berry Farm ...	*
" ...	King of the Roses	Hayes' King ...	Rose 8th (imp.)	Singleton	21 April, '12.
" ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	Berry Farm ...	*
" ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
" ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
Ayrshire ...	Royal Prince ..	Curly Prince ..	Rosie 5th ...	Grafton Farm ...	*
" ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
" ...	Jamie's Ayr ..	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
Kerry... ..	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	" "	*
"	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th	" "	*
"	Rising Sun ...	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Young P. and A. Association	G. S. Whiteman	Sept. 5, 6, 7
Germanton P. and A. Society	J. S. Stewart	,, 6, 7
Junee P., A., and I. Association	T. C. Humphrys	,, 6, 7
Ariah Park P., A., H., and I. Association	J. N. Taylor	,, 6, 7
Northern A. Association (Singleton)	F. A. Bennett	,, 6, 7, 8
Cowra P. A. and H. Association	J. T. Martin	,, 12, 13
Cootamundra A., P., H., and I. Association	T. Williams	,, 12, 13, 14
Albury and Border P., A., and H. Society	W. I. Johnson	,, 12, 13, 14
Manildra P. and A. Association	G. W. Griffith	,, 13
Canowindra P., A., and H. Association	G. Newmon	,, 19, 20
Temora P., A., H., and I. Association	W. H. Byrnes	,, 19, 20, 21
Moama A. and P. Association	A. E. Bartlett	,, 23
Burrowa P., A., and H. Association	W. Burns	,, 26, 27
Henty P. and A. Society	H. L. Yates	,, 26, 27
Ganmain A. and P. Association	J. H. Ashwood	,, 26, 27
Millthorpe A. and P. Association	R. H. French	,, 26, 27
Berrigan A. and H. Society	T. E. Crowther	Oct. 4
Adelong P. and A. Association	A. W. Molineaux	,, 10, 11
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Hillston P. and A. Association	S. I. Gordon	,, 19
Lismore A. and I. Society	T. M. Hewitt	Nov. 1, 2, 3.
Tweed River A. Society (Murwillumbah)	A. E. Budd	,, 8, 9

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Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser	,, 17, 18
Kiama A. Association	R. Somerville	,, 26, 27
Berry A. Association	C. W. Osborne	Feb. 7, 8
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Inverell P. and A. Association	J. McIlveen	.. 28–Mar. 2
Dapto A. and H. Society	J. H. Lindsay	Mar. 1, 2
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	,, 7, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15.
Bowraville A. Association	C. Moseley	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Gundagai P. and A. Society	A. Elworthy	,, 19, 20
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25.
Molong P. and A. Association	W. J. Windred	,, 27
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 27, 28, 29
Bathurst A., H., and P. Association	A. H. Newsham	April 17, 18, 19.

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Agricultural Gazette of New South Wales.

Sheep and Wool for the Farmers.

Hints on Management.

J. WRENFORD MATHEWS.

Period of Mating.

The line of breeding referred to in the previous article must be worked as one factor of thoroughly organised mixed farming, and cannot be satisfactory unless supplemented by a definite and well-planned system of cropping. The rams should be placed with the ewes at a certain definite time of the year, and many important considerations should play each its own part in determining what time this shall be. To ensure a sufficiency of suitable food for the ewes, the planting of fodder crops should be regulated so that they will become available for feeding-off just as the lambs are being born. Success in this direction depends on several conditions. Three at least of these contributing causes are of sufficient importance to deserve brief mention here. They are—(1) the locality in which the farmer is working; (2) the season, especially if very early or much delayed; and (3) the effects of climate and rainfall.

In those districts in which late summer or early autumn rains (February or March) always fall seasonably, the rams should be placed with the ewes at such a time as to ensure that the lambs will be dropped in May and June. Allowing five months as the period of gestation, this would fix November or December as the best time for mating. In the colder districts, lambing will probably be more or less delayed. Whenever circumstances will permit, the farmer will find it best to arrange for lambing to take place in the autumn. The great advantage of this plan is that, with anything like a favourable season, the lamb develops sufficiently to tide over the winter months, being then well enough grown for the early spring feed to bring it rapidly into condition. With autumn lambing, also, the ewes are less liable to be knocked about than in the case when lambs are dropped at or near to the time of shearing. Much trouble experienced by the ewes when lambing is due to their being roughly handled during the period of gestation. More especially is this the case when gestation has reached an advanced stage.

Fodder crops, comprising the earlier maturing varieties, should, if planted in time to catch the late summer rains (say in February or March) be far enough forward to be fed-off at or just prior to lambing time, that is, in May or June. Rape and barley require about eight weeks, at the end of which period, if they have had a fair rainfall, they may be profitably fed-off. But it should be remembered that the fodder crop must be chosen with regard to the nature of the season, climate, and locality. Under conditions where the rains have been delayed, it would probably take a month longer.

The Condition of the Ewe.

In whatever locality he may be situated, and under all circumstances, the farmer should guard against the practice of bringing the ewe too rapidly into condition immediately prior to lambing. When the ewes have already been running on fairly good pastures, this rule is still more imperative. The ewes should neither be too fat nor low in condition at any time during the breeding period. The former leads to trouble at lambing time. In the latter case, though they will take the ram readily, their reduced condition will fail to give the lamb a good start, so that it cannot make the same progress as a lamb more matured and better developed at birth. A sufficient and suitable supply of good milk-making food is, therefore, necessary for the maintenance of both the ewe in normal condition and the lamb in healthy active growth. If the ewes are too fat at mating they often prove sterile. Ewes at mating time should be in good store condition, active, keen, and increasing daily in flesh. Regular and suitable feed is necessary to secure this. But to attempt to force the ewe suddenly into condition just before lambing, with the object of increasing the subsequent milk supply, is to predispose it to several kinds of disease. Frequently it is attended with fatal results to both ewes and lambs.

Inflammation and fever at parturition are commonly traceable to over-feeding. It might be remarked in passing that the ewe is more frequently handicapped by insufficient food than by over-feeding. Still the latter danger is always there, and the development of the young lamb may be too easily checked in this way. Severe and, to unobservant breeders, inexplicable losses are often caused by injudicious feeding. The weak digestion of the lamb is unequal to the task of assimilating the flush of too rich milk which results from the additional feed served to the ewe. Furthermore, the fevered state of the ewe probably reacts on the condition of the milk. Many of the lesser ailments to which lambs are liable could be traced to this source, and sometimes from it arise the more serious forms of disease. Under such conditions lambs frequently "scour." Such animals, instead of being, in after life, vigorous and well-developed, bear evidence of the check in their stunted and poddy appearance.

Effects of Over-feeding.

Older sheep also suffer as a result of improper systems of feeding. Rape and lucerne are crops which often cause trouble among, for example, store wethers. With a view to rapid fattening, sheep are often abruptly changed on to a rape crop. Frequently this is done when the sheep are empty and ravenous. In such a condition the risk of death from over-feeding is always greater. The natural inclination is for the animal to gorge itself. The sheep, in common with all ruminants, possesses a four-fold stomach; or rather, there are three additional compartments of the gut before the true stomach is reached. The hastily-swallowed food enters the first compartment, the paunch or rumen. Here it undergoes maceration in the fluid contents of the rumen. This fluid consists of water which the animal has drunk,

combined with the copious secretion of the gastric glands. The evidence of veterinary authorities is to the effect that the food remains from fourteen to eighteen hours in the rumen before being returned to the mouth for mastication. If sheep be suddenly transferred from moderate pasture to rich succulent feed, the probability is that they will promptly over-feed themselves. This results in the rumen or paunch becoming overcharged. The natural movements of the gut are interfered with, and ultimately cease. The food is not returned to the mouth for mastication. The presence of this large mass of moist vegetable matter is particularly favourable to fermentation. Gas is evolved in considerable quantities, and by this means still further distension of the gut takes place, the entire digestive system fails, and unless efficient veterinary assistance be immediately obtained, the animal speedily succumbs.

Due attention to the proper regulation of the food supply is thus a matter of the utmost importance Sheep should never be placed on rape unless the paunch be partially filled with food. In view of the fact that the paunch is comparatively empty after the night's rumination, it is unwise to allow sheep to have access to rape in the early morning. It is also a matter of experience that rape will "blow" sheep more readily when the leaves are loaded with moisture, and when the plant is in bloom.

An Experience.

An accidental but instructive effect bearing on this point was observed during the present year at the Cowra Experiment Farm. In connection with a rotation system, and to carry out some feeding-off trials, a section of the cultivated area was, early in the autumn, sown with rape. Favoured by seasonable rains, this crop made rapid progress. Owing to the wet and boggy condition of the soil, the sheep could not be placed upon it before it had fully matured, and, in fact, grown somewhat rank. No other plant was sown with the rape, but between the plants and along the headlands there was a prolific growth of natural grasses of various kinds.

During the first week the sheep were allowed only a couple of hours each day on the crop, and careful watch kept over them. For the first few days they showed little inclination to take to the rape, preferring the sweeter grasses that had appeared spontaneously. As these were eaten down, they commenced to pay attention to the rape, and towards the end of the first fortnight ate it regularly. The time during which they were left on the crop was gradually lengthened. About the end of the third week, since it was considered that they would have become accustomed to the new diet, they were allowed to remain in overnight. The natural grasses were by this time eaten out, and even the rape well eaten down. Towards the middle of the second day, four were found dead. Examination left no doubt as to the cause of death. The sheep were much swollen, and the paunch contained an excessive quantity of feed in an advanced stage of fermentation. The remainder of the flock were then removed to natural pasture, and no more deaths were recorded.

Balancing the Ration.

Rape is undeniably one of the best feeds for sheep, and fattens them perhaps more readily than other fodder crops. Nevertheless, in order to obtain the maximum benefit, and to maintain the sheep in a healthy condition, it is as well to feed it in combination with some other class of herbage. Perhaps more than any other class of live stock, sheep require a variety of feed If kept too long on the one class of herbage, they are apt to sicken. A mixed diet is as necessary and beneficial to a sheep as to a human being. In "forcing" sheep into a higher condition, the risk of over-feeding is minimised when the food supply is blended and regulated.

Under most farming conditions, rape and barley grow readily, and, in combination, afford a very suitable feed for sheep. If natural pasture be available in addition, so much the better. Sheep readily fatten on rape, and the barley keeps the ewes in health, and furnishes them with a plentiful supply of milk.

Lucerne is the king of fodders, and as valuable a feed for sheep as for other classes of live stock. Like rape, though, it requires to be judiciously fed. Arising from a peculiar condition of the atmosphere, due probably to heat and moisture, there are certain stages of its growth when it is particularly dangerous to sheep. This more usually occurs at, or just prior to, the time when the plant is in the flowering stage, and more often when the sheep have been placed on it empty. As in the case with rape, they "blow"—a common term given to an affection known as "hoven," which is similar to distension of the rumen, due to fermentation by gas, only in a more acute form. Men experienced in feeding sheep on lucerne assert that sheep should never be hurriedly driven or drafted immediately on being taken off a crop. They should be given more time to allow the contents of the stomach to settle down. Probably from two to three hours would be sufficient time for this.

For the most satisfactory results accruing from the feeding-off of fodder crops, we might instance the methods in vogue at the Bathurst Experiment Farm. Mr. Peacock, in connection with his system of crop rotation, probably does more in this direction than most agriculturists in this State. Included in the farm area there is no natural pasture, so that the sheep are fed exclusively on fodder crops, and what they are able to pick up off the stubble after harvest. His method is the combination of barley and rape, sown together with the drill in alternate rows. For summer feeding, lucerne is also fed, together with cowpeas, and sometimes maize. Deaths seldom occur amongst the sheep as the result of this method of feeding. From the time at which the crops become available for feeding-off till the lambs are ready for market—a period of about five months—as many as five sheep to the acre have been carried.

Although the farmers who grow rape for sheep are comparatively few, a fair number of sheep are lost each year. As a necessary consequence of steady expansion of agriculture, the growing of food for sheep is becoming more general, and greater attention must be paid to correct balancing of the ration as a most important factor in the question of feeding.

While no invariable rule as to the method of feeding-off fodder crops can be laid down, the approved method, speaking generally, is to so regulate the number of sheep to the feed supply that the crop never at any stage approaches a condition of rankness. If fed-off in its earlier stages, and cropped short to the ground, not only is the feed kept constantly tender and succulent, but there is also less danger of the sheep suffering from the injurious effect of over-feeding. Most of the troubles proceeding from the feeding-off of fodder crops may be avoided if subsequent growths are dealt with in the same manner.

The danger of leaving sheep too long on fodder crops has already been indicated. When first placed on a fodder crop, sheep should be limited to about two hours daily. This time would, of course, be gradually lengthened as they became more accustomed to their new diet. Sheep frequently refuse rape when first placed upon it. In such a case the only plan is to more or less starve the sheep into eating it. In this connection the precaution of never allowing sheep to feed rape alone, or on an empty stomach, must, nevertheless, be rigidly observed. Moreover, the sheep soon acquire a taste for rape, and must be watched to see that they do not over-feed themselves.

Under certain special circumstances, other fodder crops have been recommended, not so much for their fodder value as for their greater immediate value as rotation crops, and also because their presence helps the subsequent growth of the wheat crop. Cowpea is a crop also recommended, but it is more suitable for summer feed.

Different aspects of this important question have from time to time been discussed in this *Gazette* by the agricultural experts of this Department.

Salt for Sheep.

Probably it is quite unnecessary to remind sheep-breeders that their flocks should have continued access to an adequate supply of salt. This is necessary at all times, but it is worth noting that the troubles to which sheep are liable as a result of insufficient salt are always aggravated if the feed be particularly rich and succulent. The more of this kind of food the sheep receive, the more liberal should be the quantity of salt provided. Liverpool or coarse salt may be recommended in preference to the somewhat harsher and more commonly used rock-salt. The best method is to provide it in troughs, which must, of course, be protected from the weather.

Mating.

The breeder should always be on his guard against an unduly protracted lambing. This may be controlled by limiting the time during which the rams are allowed to run with the ewes. The customary period is from six to eight weeks. The essential points are obviously the disposition of the ram and the type of ewe employed, as well as to the condition of both ewes and rams. Then again, all ewes do not come into season with equal readiness. Pure-bred Merino ewes take the ram at practically any time of the year. Cross-breds are somewhat shier breeders, and both cross-bred ewes and especially ewes of pure British strains, mate much less readily. This tendency becomes more marked under drier conditions, such as obtain in the

majority of Australian sheep areas. Where Merinos are concerned, to allow the rams to remain with the ewes for six weeks will, as a rule, be long enough. Cases of abortion are not unknown, due to allowing the rams to have continued intercourse with the ewes after the period of gestation has reached an advanced stage. The rams, too, fail to exercise the same vigour when allowed to remain always in the company of the ewes. In the case of cross-breds, some strains might with advantage be given an additional fortnight or so, although some cross-bred ewes mate as readily as pure Merino ewes.

Most of the British types are still less ready breeders, though one or two breeds, notably the Dorset Horn, will take the ram at almost any month. The majority, however, retain an instinctive preference for the cooler months of the year. They seldom come into season before March or April ; indeed, the rams themselves show little activity among British ewes before that time. It is interesting to observe that this is due almost wholly to the inclination of the ewes, as is evidenced by the fact that rams of British breeds used to raise cross-bred stock become active among Merino or cross-bred ewes almost as soon as they are placed together, and this too at nearly any season of the year, and without any apparent regard to the marked preference for the colder months of the year characteristic of the pure British strains. Unless this instinct is modified, however, by such conditions, it presents itself as a most persistent factor, and one which has always to be reckoned with. Considerable difficulty is often experienced in getting ewes recently brought from other and perhaps colder and later districts to take the ram at the time desired. They show a strong inclination to mate only for the later lambing season to which they have been accustomed. This condition can be best dealt with by making the change by degrees. Suppose, for instance, that ewes have been accustomed to lambing late in the year (say September or October), and the new conditions favour an autumn lambing. The change should be gradual. Mating should take place a little earlier each year until the required change has been effected.

Condition.

The temperament of the rams and the condition of the ewes at the time of mating are matters which cannot be overlooked in aiming at a productive, uniform, and satisfactory lambing. Success depends very largely upon the condition of the ram. He should be maintained in the highest possible vigour, active, alert, and in "good heart." Certain specifics are sometimes employed to stimulate the animal's sexual desire, but their effect is only temporary, and their use is necessarily followed by the usual reaction and exhaustion. It is, in general, inadvisable to have recourse to such means. A similar but more permanent result, and one free from undesirable after-effects, may be produced by allowing the ram richer and more nutritious foods, such as possess a relatively high protein content. As a definite suggestion, it may be mentioned that a quarter of a pound of crushed oats, in addition to his usual feed, will generally be found sufficient to give the ram the necessary vigour. If lucerne be available, that fodder will also be found to have considerable value from the present standpoint.

Hand-feeding.

Few farmers appear to realise what substantial profits accrue from even a little hand-feeding. Often they discontinue the production of a certain cereal, although their district may be eminently suited to its growth, because market rates have been weakened by large production or some other cause. It seldom occurs to the farmer that he may cater for large and settled demands by sending his grain to market in the form of wool and mutton. Even a few ounces of crushed oats daily for a short period will make a wonderful improvement in the condition of a sheep.

The appended table gives results obtained at the Wagga Experiment Farm last year. The sheep which formed the subject of the experiment were wethers, but what will improve the condition of a wether will equally improve the condition of a ram or a ewe.

Breed.	Partly hand-fed				Fed on natural pastures.			
	Average body weight.		Average weight of fleece.		Average body weight.		Average weight of fleece.	
Shorn at 2 years 5 months.								
FIRST CROSSES.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Border Leicester x Merino ...	139	0	11	14	132	0	9	4
Dorset Horn x Merino ..	150	0	10	12	142	8	7	8
Shropshire x Merino..	121	0	10	4	119	8	9	6
SECOND CROSSES.								
Shropshire x Lincoln-Merino	119	0	11	0	137	0	10	7
Border Leicester x Lincoln-Merino	168	8	12	2	145	0	9	9
Hampshire x Lincoln-Merino	144	0	11	4	119	0	8	12
Dorset Horn x Lincoln-Merino	161	8	9	4	158	0	7	0
Dorset Horn x Border Leicester-Merino ...	165	8	10	10	171	0	8	8
Shorn at 1 year 5 months.								
FIRST CROSSES.								
Lincoln x Merino	109	8	12	14	100	5	11	5
Border Leicester x Merino ...	114	8	11	2	96	12	10	2
Cheviot x Merino	99	8	9	14	83	8	8	8
Cotswold x Merino ..	112	0	13	12	97	8	10	14
Dorset Horn x Merino	121	0	9	8	108	4	8	12
Shropshire x Merino...	96	8	10	4	83	12	9	2
Hampshire x Merino..	92	12	9	6	86	8	8	8
South Down x Merino	91	0	9	6	81	5	9	7
SECOND CROSSES.								
Border Leicester x Lincoln-Merino	111	8	12	10	107	0	10	5
Border Leicester x Dorset Horn-Merino ...	112	0	11	10	116	0	10	8
Cheviot x Lincoln-Merino ...	107	8	9	14	96	4	8	8
Cotswold x Lincoln-Merino ..	104	0	13	12	97	10	10	12
Dorset Horn x Lincoln-Merino	132	0	10	8	116	0	8	8
Dorset Horn x Border Leicester-Merino ...	120	8	9	8	130	8	8	10
Shropshire x Lincoln-Merino	117	0	11	4	105	8	10	7
Shropshire x Border Leicester-Merino	110	8	10	6	90	12	9	5
Shropshire x Dorset Horn-Merino...	116	8	9	10	97	0	8	12
Hampshire x Lincoln-Merino	124	0	11	2	104	4	9	12
South Down x Lincoln-Merino	113	8	10	4	99	4	8	7
South Down x Border Leicester-Merino ...	98	8	8	8	84	8	8	8

During most of the first half of 1910, unusually dry conditions were experienced in the Riverina, and indeed over almost all of the southern areas of this State. A number of cross-bred sheep were being kept for experimental purposes at the Wagga Farm. The value of the information obtained from these experiments in cross-breeding would have been very largely discounted if the sheep had lost condition. To the Manager of the Farm is due the credit of maintaining the sheep in the necessary condition, and of instituting and recording the feeding trials. In these trials, the main feature of interest is the marked success of hand-feeding. The table tells its own story, and further comment is needless. The feed allowance was a quarter of a pound of crushed oats daily, in addition to the pickings of a lucerne paddock on which the growth was, as might be expected, in an unfavourable season, somewhat scanty. The rest of the sheep were fed exclusively on natural pasture. Even those partly hand-fed were only so rationed for six weeks at a critical period.

A very simple calculation will serve to show how very economically this satisfactory result was obtained. Each sheep received on the average 10 lb. of oats during the six weeks. At, say, 1s. 6d. per bushel (the actual cost of production on the farm was only 1s. per bushel, but it may be assumed that the ordinary farmer has to buy his oats in the open market), the average cost per head was about 4½d.

Whilst the gains in weight at 2 years and 5 months averaged 6 lb. in body and 2 lb. in fleece, the gains at 1 year and 5 months were 11 lb. and 1¼ lb. respectively. Taking mutton at 1½d. per lb., current wholesale rates, and wool at, say, 8d., and allowing for cost of feeding, the net returns per head for the hand-feeding of the older and younger sheep may be stated at 1s. 9d. and 1s. 8d. respectively.

Accommodation.

It is an advantage to accommodate the ewes in a small paddock. Ewes are often missed owing to their being away in some remote corner of the paddock just when they come into season. Yarding the sheep overnight will help towards a satisfactory lambing, especially if rams show little inclination to work amongst the ewes during the day. When rams show disinclination to stir amongst the ewes, a good plan is to spell them. If separated for a few days, placed in a small paddock, and supplied with a little extra rich feed, they will resume work, when replaced in the flock, with renewed vigour. In smaller flocks a high percentage of lambs may generally be secured in this way.

This plan should be followed where a limited number of rams are provided for the flock. A good device is to colour the fore part of the belly and the brisket of the ram, red or blue raddle being used for the purpose, so that he may leave a record of his activities during the night. Moreover, it is poor

economy to risk the increase of lambs for the sake of saving a small expense that an extra ram or two would involve. The pregnancy of half a dozen additional ewes would more than compensate for the additional outlay necessary to provide an extra ram.

The number of rams necessary varies according to circumstances and the specific characteristics of the breed. For Merino ewes, where the paddocks are not too large, 2 per cent. of rams should be sufficient. For cross-bred ewes, and especially where Down rams are employed for the express purpose of raising an early lamb, the allowance of rams may with advantage be increased to $2\frac{1}{2}$ per cent. It is not advisable to divide the flock into too many small lots, since the rams, from a spirit of rivalry, usually work better the more there are of them.

Age of the Ewe.

As regards mating, breeders are somewhat divided in their opinions as to the most suitable age at which ewes should be joined with the rams. But perhaps a point still more in dispute is the best age at which to select Merino ewes to mate with rams of British breeds.

Under average conditions, such as obtain in the bulk of our sheep areas, eighteen months would probably be the best age at which ewes should first be placed with the ram. Allowing five months as the period of gestation, this would fix the age at about two years when the lambs should be born. But the age at which ewes should be mated depends mainly upon the breed and the class of ewe concerned. In view of the later and earlier maturing qualities of different breeds, this difference must, to a very large extent, determine the age of mating. As compared with the majority of British breeds, the Merino may be evidenced as a slow developer. Moreover, all types of Merino do not come to the state of puberty at the same age. The Merino of the colder districts, compared with that bred and reared in the hot dry districts, is much slower in its development. In view of this slower development, it would probably be an advantage to delay mating Merino ewes raised in cold districts, till they are a year older. It does not necessarily follow that the year's increase would thus be lost, because, whilst maturing later, it would meanwhile develop, and thus preserve its constitution during later stages of its life. In a lesser degree much the same applies to the Lincoln, which is also a slow-maturing breed.

The ram is usually ready for service at the age of between one and two years. It is a common practice to use lamb rams with the object of securing earlier development in the progeny. As an advantage, it is claimed that the younger the ram the more vigorous he is amongst the ewes. Whatever advantage may be gained in this direction is discounted in after life, for rams that have done service as lambs fail ever to make the same progress. Their growth is checked, and they usually present a stunted appearance. If used as lambs they should only receive a very limited number of ewes.

The Maiden or older Ewe.

In view of the difficulty experienced by Merino ewes in delivering lambs to larger-framed British breeds, and the great mortality often caused in this way, it has become a vexed question as to which is the most suitable age to mate ewes of this breed with English rams.

Both the maiden and the older ewe have their advocates. Some consider that as the frame of the young ewe is not fully set, it is physically better fitted to suffer the task. As an advantage for the older ewe, it is claimed that she is a better mother, and this in itself is sufficient to recommend her in preference to the young ewe, which is inexperienced. From personal observation, the best age is between two and three years. When mated with the ram at this age, the lambs would be dropped at $2\frac{1}{2}$ to $3\frac{1}{2}$ years. Should the ewe have been well preserved, possess a good constitution, and have a perfectly sound mouth, even four years would not be too old to mate her. But it is mere folly and false economy to purchase old broken-mouthed ewes to mate with British breeds, in the expectancy of raising profitable cross-bred sheep. Nor should the ewe be kept too long to breed from. Immediately the teeth show signs of decay, the constitution begins to decline, and as falling-off in wool production necessarily follows, it should no longer be used for breeding purposes. Just before the shearing, the flock should be gone through carefully, and all ewes showing broken mouths and light wasty fleece, included with those that are short, should be rigorously culled. These should be legibly marked, and after shearing fattened and sold as soon as possible.

The Lambing.

As the lambing season approaches, the ewes should be inspected daily. When Merino or cross-bred ewes have been mated with a British breed, they will frequently require some assistance. Towards the end of the fifth month a close watch should be kept in order to note the condition of the ewe.

Whoever is in charge of the flock should move quietly amongst the ewes. No dog should be allowed to enter the paddock, and nothing tending to disturb or excite them should be allowed. If they show signs of difficult labour, assistance will generally be required. The attendant, however, should not hastily interfere. Where labour has been protracted for some hours, the ewe will probably show signs of exhaustion, and will receive attention without offering much resistance.

The ewe should be placed on her feet, the position of the fœtus ascertained, and the nature of the presentation determined. The part of the fœtus that first becomes visible is known as the presentation. The most usual presentation is that of the muzzle and the two fore-legs. This is the easiest presentation, and does not, as a rule, require any interference. Sometimes, however, instead of the muzzle, the top of the head or the back of the neck

presents itself. Again, the presentation may consist of the breech of the animal, the tail being generally protruded. The most difficult are the transverse presentations, in which the flank or back of the fœtus (recognisable by the feel of the ribs or the spines of the vertebræ respectively) presents itself.

In the muzzle and fore-legs presentation, as previously stated, the services of the attendant are seldom required. When, however, this position is varied so that the top of the head or the back of the neck is presented instead of the muzzle, the fore-legs should be pushed back. The hand should then be well oiled or greased, and inserted through the vagina into the uterus, palm upwards and concave. The tip of the middle finger should be inserted into the mouth of the fœtus, the head raised by this means into the normal position, and so delivery effected.

A breech presentation is rather a difficult position. The tail should first be pushed back. The hand should then be inserted into the uterus and the fœtus manipulated, with the object of turning it back uppermost, and getting the two hind feet in the palm of the hand. This would enable the fœtus to be drawn gently outwards, tail first. In such a case, care should be taken to see that the tail is lying in its natural position between the hind legs, otherwise it is liable to be broken. In this case, delivery should be effected as rapidly as is consistent with all necessary care and gentleness.

In transverse presentations, whether of the back or flank variety, the hand must be introduced within the uterus and the fœtus brought if possible into the fore-legs and muzzle position; or failing that the hind legs may be secured, as previously described.

Probably the most difficult single presentation is when the head is forward and the front legs are lying at the side of the body. In this case it is seldom that the lamb is taken from the ewe alive. Generally the lamb is killed to save the mother. This is a most difficult operation, and requires considerable skill and promptitude for its successful performance. The head should first of all be held securely in one hand, while the other is used to sever it at the first joint of the neck. As soon as the fœtus has finally ceased to struggle, the neck should be pushed back into the uterus, the hand inserted, the fore feet brought up into the normal position, and the body gently drawn out.

In cases where manipulation must be attempted, the fœtus must be restored to its original situation in the fundus of the uterus before this is undertaken. Practically nothing can be accomplished in this direction in the narrower channels of the neck of the uterus and the vagina.

In preparing the hand, the best lubricant is the natural fluid itself; but, failing this, vaseline or salad oil will generally be found to answer the purpose.

The Natural Increase.

The following tables show, for comparative purposes, the natural increase from the Merino and different cross-bred ewes with which have been mated the various types of British breeds. These particulars cover part of the experimental work done at the Wagga Farm during the seasons 1909 and 1910 :—

1909.

Crosses.	Ewes.					Lambs.	
	Number Mated.	Number at "Marking."	Number Lost.	Number Assisted.	Percentage Assisted.	Number Marked.	Percentage Increase.
FIRST CROSSES.							
Lincoln x Merino	40	38	2	7	17	23	57
Cotswold x Merino	25	24	1	3	12	19	76
Border Leicester x Merino	30	30	...	3	10	22	73
Cheviot x Merino	25	23	2	2	8	12	48
South Down x Merino	25	24	1	1	4	23	96
Shropshire x Merino	25	25	...	4	16	17	68
Dorset Horn x Merino	30	30	...	2	6	20	66
	200	194	6	22	11	136	68
SECOND CROSSES.							
Cotswold x Lincoln-Merino	30	30	...	3	10	20	66
Border Leicester x Lincoln-Merino ...	70	70	...	9	12	50	71
Cheviot x Lincoln-Merino	30	29	1	...	...	14	49
South Down x Lincoln-Merino	25	25	...	3	12	25	100
Shropshire x Lincoln-Merino	118	114	4	23	20	93	81
Hampshire x Lincoln-Merino	50	50	...	2	4	42	84
Dorset Horn x Lincoln-Merino... ...	70	69	1	13	18	54	78
	393	387	6	53	13·48	298	75·82
South Down x Border Leicester-Merino	10	10	...	...	...	5	50
Shropshire x Border Leicester-Merino ..	9	9	...	1	11	8	88
Dorset Horn x Border Leicester-Merino	10	10	...	1	10	8	80
	29	29	...	2	6·89	21	72·41
Border Leicester x Dorset Horn-Merino	5	5	...	...	...	3	60
Shropshire x Dorset Horn-Merino ...	6	6	...	...	...	5	83
	11	11	...	...	...	8	72·72

Of the twelve ewes that died between the time of mating and that of lambing, only three died during the lambing season, and of the seventy-seven ewes assisted, only one died. Thirteen lambs were killed by foxes.

1910.

Crosses.	Ewes. Number Mated	Ewes. Number at "Marking."	Ewes. Number Lost.	Lambs. Number Marked.	Lambs. Percentage Increase.
FIRST CROSSES.					
Lincoln x Merino	50	48	2	33	66
Leicester x Merino	52	48	4	32	61
Border Leicester x Merino	50	50	..	39	78
South Down x Merino	12	12	...	11	91·66
Shropshire x Merino	12	11	1	9	75
Hampshire x Merino	13	10	3	11	84·61
Dorset Horn x Merino	12	12	...	9	75
	201	191	10	144	71·09
SECOND CROSSES.					
Border Leicester x Lincoln-Merino ...	76	76	...	59	77·63
South Down x Lincoln-Merino	50	50	...	42	84
Shropshire x Lincoln-Merino	95	93	2	82	86
Hampshire x Lincoln-Merino	49	49	...	42	85·71
Dorset Horn x Lincoln-Merino	95	94	1	83	87
	365	362	3	308	84·38
Shropshire x Border Leicester-Merino ...	26	26	...	17	65·38
Dorset Horn x Border Leicester-Merino ...	26	25	1	17	65·38
	52	51	1	34	65·38

POISONING SPARROWS.

MR. H. F. PARSONS, Woodstock, Condobolin, states that he ploughed a small patch of garden soil in June, and after powdering a quart of wheat with diluted strychnine, sowed it broadcast, with such marked effect that the sparrows have never accumulated in such numbers since. Mr. Parsons considers winter an excellent time to cope with the sparrow pest, as there are no seeds in the open, and sparrows collect about the houses, barns, and stacks for pillage.

Mr. Valder suggests, as an alternative remedy, that wheat be soaked in a moderately strong solution of rabbit phosphorus poison, and sown broadcast over a newly-sown crop. But both methods are most effective in the early part of the wheat season.

Insectivorous Birds of New South Wales.

[Continued from page 612.]

21. Laughing Jackass.

As this series of articles is intended to embrace typical specimens of all the insect-eating groups of native birds, it is necessary to include the Great Brown Kingfisher, or Kookooburra, or, as he has been popularly called since the early days of the colonies, the "Laughing Jackass." But to urge that he should be protected from shot-gun or pea-rifle would be waste of time and space, as there is probably no bird or animal in the whole native fauna which is a greater favourite with us all. By common consent he has always been regarded as an essential part of Eastern Australia. His great strong beak gives him a peculiar top-heavy appearance, but it is the rising, weird shriek of laughter which makes the bird so well loved. It is heard in the big timbers at dawn, seeming to call the settler to another day of toil and hope; and at evening when the birds are going to rest for the night, the forest again rings with loud eerie peals of absurd mockery, as though the spirits of the bush were defying the white man's efforts to make a home. Sometimes a stray jackass wanders into the suburbs of Sydney, perches on a garden fence or clothes-prop, and rouses many dreaming citizens to memories of their far-off childhood's days, when the shop, the office, and the electric tram were to them unknown.

Ask a bush boy what does the jackass eat, and you will get your answer pat—"Snakes." Then you will be told of one of the birds having been found in a helpless condition, with a half swallowed and partly digested snake protruding from its mouth, and regret will be expressed that you had not been along with your camera in time. Undoubtedly, the birds kill snakes for food; and though the number of snakes destroyed in this way cannot be sufficient to remove the reptiles from the country, still this is a sound argument used by the bushman in favour of his feathered mate. The jackass also eats beetles, rats, mice, centipedes, and other vermin, often pulping its food by dashing it against a limb before swallowing; and as there is no record of its ever touching grain or fruit, there is a strong case in favour of its retention as a useful scavenger as well as a peculiarity. The case is weakened when it is noted that it eats many young insectivorous birds, sometimes attacks chickens, will remove gold-fish from ornamental ponds, and, as Mr. Hall points out, destroys many useful insect-eating lizards. But these disadvantages are inseparable from the existence of a powerful-billed insectivorous bird. We can protect our chickens and our acclimatised fish from any of the birds which develop these vicious habits, but we have no control over the growth of injurious life in the uncleared mountain country, and we can only surmise what pests would come to ravage a district if the jackasses were destroyed. It would be very difficult to induce any local organisation to try the experiment.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"LAUGHING JACKASS."

Dacelo gigas, Bodd.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"MORE-PORK."

Podargus strigoides, Lath.

When caught young the jackass is easily tamed; but the old birds fight most savagely when the nest containing eggs or brood is interfered with. The nest is usually a convenient hollow in a tree, decayed wood being used as a floor. Occasionally a hole is burrowed in a white ants' nest. Two or three pure white eggs are laid, and two broods are generally reared in a season.

The popular name, "Jackass," is a corruption of the French word *Jacasse*, meaning "Kingfisher," given to the bird by the early French explorers.

Total length of bird in the flesh, 17·5 inches; wing, 8·6; tail, 6·25; bill, 2·5.—(NORTH.)

22. More-pork.

This is another bird which must be included to complete the list, though it is in no danger of extinction. Its protection, however, depends not upon its popularity, but upon its own peculiar habits. It is a nocturnal bird, seeking its food by night and sleeping by day, and whilst at rest its colour so matches the limb upon which it lies that it is rarely seen by the ordinary observer.

The bird to which the name "More-pork" is given is not the bird which utters the cry resembling "More-pork" or "Mo-poke" in wooded gullies at night. That cry comes from the Boobook Owl, another insect-eater which will be shown in a future issue. Several writers make the assertion that the confusion has arisen from a popular idea that *Podargus strigoides* is responsible for the mournful note; but Mr. North has shown that the real cause was the fact that some of the early scientists confused the two birds. The ordinary layman seldom sees this bird, and could not attempt to identify the bird which produces the peculiar sound heard at night.

The true note of this specimen is a feeble cry like "Oom, oom, oom," repeated a dozen or more times. It is an inoffensive creature, perching in the fork of a tree by day to sleep. If disturbed it will stretch itself out parallel to a limb and remain motionless, so that if seen at all it may be mistaken for a lizard or iguana. It will generally choose for its resting place a position where another overhanging limb protects it from the attacks of hawks or other swooping birds of prey. Its nest is a flimsy structure of sticks, just sufficient to hold the two or three eggs, placed in the fork of a tree.

At night-time, the More-pork visits open forests or clearings and gardens in search of food. It sits upon a limb or stump, or a fence-post, and keeps watch for passing insects, upon which it pounces, and then returns to its original position. Mr. North found the contents of stomachs of these birds to include the remains of frogs, crickets and spiders, and the heads and wing cases of large beetles. Mr. Hall has observed that the birds devour centipedes, tarantulas, crustaceans, and many hard-winged insects, and states that they are excellent destroyers of garden vermin, slugs in particular. Mr. W. W. Froggatt, Government Entomologist, has fed pet ones on mice, which they would take alive at one gulp. This should be quite sufficient to show their value to agriculture.

Total length of male bird, 19 inches. The female is slightly smaller.

Field Experiments with Wheat.

Conducted under the direction of GEO. L. SUTTON, late Wheat Experimentalist.

III.—A FERTILISER TRIAL.

Object.—To determine the most suitable and economical source of phosphorus to use as a fertiliser for the staple and rotative crops of the different districts in which the experiment is planted, *i.e.*, to determine the effect of climate upon the availability of the phosphorus in the different commercial phosphatic manures.

The following phosphatic manures are being compared with each other, viz. :—

(1) Bone-dust.
(2) Superphosphate.
(3) Rock phosphate.
(4) Bone charcoal.
(5) Thomas' phosphate.

The relative and comparative value of the phosphorus from the different sources is determined by comparing the yields from plots fertilised with phosphorus obtained from the respective sources enumerated above, with the yields from check plots which have not received an application of any phosphatic fertiliser.

So that the effect of the application of the different phosphatic manures may not be influenced by a deficiency of nitrogen or potash, the nitrogen and potash content of each plot is maintained. The nitrogen content is kept up by the rotation adopted, the potash content by the application of sulphate of potash to each plot.

The amount of phosphorus and potash applied to any plot is what is considered sufficient to replace that removed by the system of cropping followed.

At the commencement of the experiment, provision was made for the fertiliser to supply per acre—

Phosphoric acid (P_2O_5)	15 lb.
Potash (K_2O)	15 lb.

As bone-dust contains a certain percentage of organic nitrogen and the other phosphatic manures do not, it is necessary to add organic nitrogen to all the phosphatic fertilisers except bone-dust, in order to make the conditions uniform for all the fertilisers. This is in the form of dried blood. The amount added is equivalent to that supplied by the bone-dust necessary to furnish the required amount of phosphorus.

The quantity of nitrogen, phosphorus, and potash added to the plots receiving such is the same for each.

The check plots do not receive any phosphatic manure, but as all the other plots, in addition to a phosphatic manure, receive (for reasons already stated) an application of nitrogen and potash, it is necessary to also apply the same amount of nitrogen and potash to the check plots.

As the check plots become depleted of their available phosphorus, it is considered that the effects of the application of the various phosphatic manures will become noticeable. The results can then be compared.

The actual differences due to the various fertilisers applied are not estimated by comparing the yields of the plots one with another, but by comparing the differences which exist between the actual yields of the plots and the yields which it is estimated they would have produced had they been planted as check plots. This estimate of "natural" yield is based upon the assumption that the differences between neighbouring check plots are due to regular and similar variations in the soil between them. The natural yield of any plot will therefore be intermediate between that of its two check plots, and proportionate to its distance from them.

WHEAT FERTILISER TRIAL, COWRA EXPERIMENT FARM, 1910.

F. DITZELL, Experimentalist.

THIS experiment has been carried out in accordance with the general directions given above.

The rotation adopted is a two-course one, in which wheat alternates with a leguminous crop, the rotative crop grown at this Farm being field-peas. The rotative crop is a legume, in order to keep up the nitrogen content of the soil, attention being directed to this in the general directions given above. On account of the rotation, two blocks are required, those reserved being two portions of H VI.

Prior to the commencement of the experiment, these blocks had been cropped and manured in a uniform manner, so that the land was in an even and suitable condition for the planting of this experiment. The land was cleared and broken up in 1906, and from then until the planting of this experiment it had been cropped as follows:—

1906.—Algerian oats, without fertiliser, for hay.

1907.—In the autumn, black tares (or vetches) were sown, to which a mixed fertiliser, composed of superphosphate 4 parts, and sulphate of potash 1 part, was applied at the rate of 54 lb. per acre. A self-sown crop of oats grew up amongst the tares and was harvested for hay. After this a crop of cowpeas was sown, these being fed-off in the autumn of 1908.

1908.—Wheat, fertilised with superphosphate at the rate of about 40 lb. per acre.

1909.—Rape, fertilised with superphosphate at the rate of about 40 lb. per acre, was sown in the autumn. Later in the year cowpeas were sown, and were fertilised with a mixture composed of superphosphate 4 parts, and sulphate of potash 1 part, applied at the rate of 54 lb. per acre.

Preparation of the Ground.

The preceding crop of cowpeas having been fed-off with sheep over the whole of the block, the land was disc-cultivated in March, after which it was disc-cultivated and harrowed whenever necessary until planting time, to maintain a loose mulch of earth about 3 inches deep, and to destroy all weed growth.

Planting.

The different plots were arranged as per sketch A (p. 848), and were planted on the 27th May, 1910.

The plots were 16 links wide, to accommodate the width of the drill.

Bunyip was the variety of wheat used, the rate of seeding being 42 lb. per acre.

To prevent the occurrence of bunt (smut) in the succeeding crop, the seed was treated with bluestone, 2 per cent., and salt, 2 per cent.

The quantities of fertilisers applied per acre to the various plots are shown on sketch A. These were calculated from the analyses of the various fertilisers, so that each quantity of fertiliser would supply the amount of phosphoric acid (15 lb.), potash (15 lb.), and organic nitrogen (an amount equivalent to that supplied by the bone-dust necessary to supply the required amount of phosphoric acid), which it had been arranged to supply per acre. Each mixture of these fertilisers was previously mixed up with sand to a certain bulk, so that the drill was set to sow at the same rate, namely, 116 lb. of fertiliser per acre, for each mixture.

The ground at time of planting was in first-class condition and moist, thus resulting in a good germination of the seed.

Rainfall.

The rainfall recorded during the year was given in the June *Gazette*, page 484.

Observations during Growth.

On the 5th August, the plots fertilised with blood, *superphosphate*, and sulphate of potash (Plot No. 4); and blood, *Thomas' phosphate*, and sulphate of potash (Plot No. 9) had made the best growth. The differences between the other plots were not sufficiently marked to admit of notation.

On the 24th of the same month these two plots were still the most forward; with plot No. 3, fertilised with *bone-dust* and sulphate of potash, next to them. Plots No. 6, fertilised with blood, *rock phosphate*, and sulphate of potash; and No. 7, fertilised with blood, *bone charcoal*, and sulphate of potash, were slightly better than their neighbouring check plots; and all the remaining plots were very even in appearance.

Harvesting.

Before harvesting, the plots were reduced to one-tenth of an acre each in area, by cutting off the ends. The several plots were harvested for grain with a stripper and winnowed on the 17th December, and from the weights thus recorded, which are those of a farmer's sample, the yields per acre have been computed.

Results.

Table I shows the results obtained from this experiment, and from it the various fertilisers may be arranged in order of merit, as follows:—

(1) Unmanured.
(2) Thomas' phosphate.
(3) Bone-dust.
(4) Superphosphate.
(5) Bone charcoal.
(6) Rock phosphate.

It will be noticed that the plot which received no manure whatever gave the highest yield. It must, however, be pointed out that at present the ground should contain a sufficient quantity of phosphoric acid to produce excellent wheat crops, because it has only been under cultivation for five years, and during that time, as reference to a previous portion of this article will show, it has received two applications of superphosphate, and also two more of a mixture containing a large proportion of superphosphate.

As these results are also obtained from ground in which the experiment has been planted for the first time, no definite conclusions can be drawn from them. It is pointed out in a foregoing portion of this article that it is considered that the effects of the application of the various phosphatic fertilisers will become noticeable as the check plots become depleted of their available phosphorus, which will not be for a few years, and that the results can then be compared.

The terms "natural" and "percentage" yields were fully explained by Mr. Sutton in last February *Gazette*, under "Tillage Experiments with the Plough," page 167.

The average yield of Bunyip from all the plots in this experiment was 34·331 bushels per acre.

EXPERIMENT III.—Fertiliser Trial with Wheat, Cowra Experiment Farm, 1910.

Sketch A.

Length of each Plot—875 links.
Width—16 links.
Area—·14 acre.

Plot No. 1.	Unmanured	DIVISION.
Plot No 2.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 3.	Bone-dust, 63 lb. per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 4.	Blood, 21 lb. per acre. Superphosphate, 87 lb. per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 5.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No 6.	Blood, 21 lb. per acre. Rock phosphate, 54·5 lb. per acre Sulphate of potash, 29 lb. per acre.	
Plot No. 7.	Blood, 21 lb. per acre. Bone charcoal, 50 lb. per acre. Sulphate of potash, 29 lb. per acre.	
Plot No. 8.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 9.	Blood, 21 lb. per acre. Thomas phosphate, 81 lb. per acre. Sulphate of potash, 29 lb. per acre	
Plot No. 10.	Unmanured.	
Plot No. 11.	Blood, 21 lb. per acre. Sulphate of potash, 29 lb. per acre.	*Check plot.*
Plot No. 12.	Unmanured.	DIVISION.

TABLE I.

THE results obtained from the use of the various phosphatic fertilisers:—

Variety—Bunyip.

Date planted—27th May, 1910.

Date harvested—17th December, 1910.

Plot No.	Fertiliser used on plot.*	Computed Yield per acre.	Natural Yield per acre.	Percentage Yield.
		bushels.	bushels.	
2	*Check plot.*	31·83	31·83	100
3	Bone-dust.	34·50	32·66	105·63
4	Superphosphate.	35·00	33·50	104·47
5	*Check plot.*	34·33	34·33	100
6	Rock phosphate.	33·33	34·27	97·25
7	Bone charcoal.	35·33	34·22	103·24
8	*Check plot.*	34·16	34·16	100
9	Thomas' phosphate.	36·00	33·72	106·76
10	Unmanured.	36·00	33·28	108·17
11	*Check plot.*	32·83	32·83	100

* In addition to the phosphatic fertilisers mentioned, all the plots except Nos. 3 and 10 received an application of dried blood and sulphate of potash. No. 3 received sulphate of potash only, as the bone-dust contains nitrogen. No. 10 was entirely unmanured. Sketch A shows the exact manuring. In this table the phosphatic manures only are given, as these were the manures compared, and which caused the differences in yields.

WHEAT FERTILISER TRIAL, WAGGA EXPERIMENT FARM, 1910.

R. W. McDIARMID, Experimentalist.

THE object of this experiment, and the general arrangements for carrying it out, have been explained above. The arrangement of the plots at Wagga Farm is shown in plan B.

EXPERIMENT III.—Fertiliser Trial with Wheat, Wagga Experiment Farm, 1910.

Plan B.

Plots = 890 links × 27·5 links.
= ·24475 acre.

	BUFFER PLOT.		(Unmanured.)
		per acre. lb.	
1.	Blood... ... ... Sulphate of potash... ..	21 29	*Check plot.*
2.	Bone-dust ... . Sulphate of potash	63 29	
3.	Superphosphate ... ... Sulphate of potash .. ... Blood	88 29 21	
4.	Blood .. .. Sulphate of potash... ...	21 29	*Check plot.*
5.	Blood... ... ... Rock phosphate ... ... Sulphate of potash... ..	21 55 29	
6.	Blood.. ... ... Bone charcoal ... ... Sulphate of potash... ...	21 50 29	
7.	Blood .. .. Sulphate of potash	21 29	*Check plot.*
8.	Blood .. . . .. Thomas' phosphate . ... Sulphate of potash	21 81 29	
9.	No manure.		
10.	Blood .. .. Sulphate of potash... ...	21 29	*Check plot.*
	BUFFER PLOT.		(Unmanured.)

The manures for each plot were previously mixed with fine earth to enable even distribution of the required amounts to be made throughout each plot.

Results.

The effect on the young growth was most noticeable in plots 3 and 8, where superphosphate and Thomas' phosphate had been applied. The bone charcoal and bone-dust did not show any effect till later, while the plot receiving rock phosphate appeared equal only to the check plot throughout growth.

The effect of the different manures on ripening, and the results obtained, are shown in Table I.

TABLE I.

Variety—Bunyip.

Date planted—10 May, 1910.

Area of plots harvested = ·24475 acre.

Plot.	Manure.*	Date.		Yield.			
		Flowered.	Ripe.	Plot.	Computed per acre.	Natural	Percentage.
				lb.	bushels.	bushels.	
1	*Check plot*...	30 Sep.	17 Nov.	170	11·58	11·58	100·00
2	Bone-dust	29 ,,	16 ,,	303	19·27	13·26	145·32
3	Superphosphate ...	26 ,,	12 ,,	374	25·47	14·94	170·48
4	*Check plot*...	30 ,,	17 ,,	244	16·62	16·62	100·00
5	Rock phosphate ...	29 ,,	15 ,,	237	16·13	16·01	100·75
6	Bone charcoal... ...	29 ,,	16 ,,	256	17·43	15·39	113·25
7	*Check plot*...	30 ,,	17 ,,	217	14·78	14·78	100·00
8	Thomas' phosphate ...	28 ,,	14 ,,	284	19·33	15·30	126·33
9	No manure	1 Oct.	17 ,,	226	15·38	15·83	97·16
10	*Check plot*...	1 ,,	17 ,,	240	16·35	16·35	100·00

* Only the phosphatic manures are shown in this table (*vide* note, page 840). For complete manures, see Plan B.

From the above table, it will be noticed that the plot manured with superphosphate gave the highest percentage yield, followed by that manured with bone-dust.

The experiment will be carried on for a number of years to ascertain the effect of continually applying the same phosphatic manure to the same piece of ground.

The high percentage yield obtained from the use of bone-dust may have been influenced somewhat by the age of the manure, it having been in stock since about 1903. The original analysis of the manure, and that obtained last year, are given hereunder:—

Date of Analysis.	Available Phosphoric Acid.	Nitrogen.
	per cent.	per cent.
1903	23·8	3·9
1910	24·4	3·29

WHEAT FERTILISER TRIAL, BATHURST EXPERIMENT FARM, 1910.

R. G. DOWNING, Acting Experimentalist.

THIS experiment was conducted on similar lines to that at Cowra Experiment Farm, the same manures being used. The following table gives the results for the year :—

Manure.		Plot Yield.	Acre Yield.	Natural Yield.	Percentage Yield.
		lb.	bus.	bus.	
Blood, 21 lb. ... ... Sulphate of potash, 29 lb.	*Check*	156	19·5	19·5	100
Bone-dust, 63 lb. ... Sulphate of potash, 29 lb.	...	173	21·6	20·83	108·8
Blood, 21 lb. ... ... Superphosphate, 87 lb.... Sulphate of potash, 29 lb.	...	171	21·4	22·16	96·5
Blood, 21 lb. ... ... Sulphate of potash, 29 lb.	*Check*	188	23·5	23·5	100
Blood, 21 lb. ... ... Rock phosphate, 54·5 lb. Sulphate of potash, 29 lb.	...	189	23·7	23·1	102·6
Blood, 21 lb. ... ... Bone charcoal, 50 lb. ... Sulphate of potash, 29 lb	...	197	24·7	22·7	108·8
Blood, 21 lb. ... ... Sulphate of potash. 29 lb.	*Check*	178	22·3	22·3	100
Blood, 21 lb. ... ... Thomas' phosphate, 81 lb. Sulphate of potash, 29 lb.	...	182	22·8	23·1	98·7
Unmanured	...	172	21·5	23·9	89·9
Blood, 21 lb. ... ... Sulphate of potash, 29 lb.	*Check*	197	24·7	24·7	100

It will be seen that the best results this year were obtained from bone-dust and bone charcoal as the means for supplying the phosphoric acid. These manures gave percentage yields of 108·8, as against 100 from the check plots. Superphosphate apparently reduced the yield, but no conclusions should be drawn until the experiment has been carried out for a number of years.

STARTING WHEAT-GROWING WITH SMALL CAPITAL.

MR. H. O'BRIEN, of Blayney, when starting wheat-growing some years ago, leased a paddock of 640 acres for five years. He obtained it rent free for two years for the clearing of it. The timber was mostly dead. He started a number of clearers to work, supervising them himself, during the first week in February, and he had the whole 640 acres under wheat by the latter end of June. The clearing cost 12s. 6d. per acre.—MARK H. REYNOLDS, Inspector of Agriculture.

Factory Managers' Butter Exhibition.

M. A. O'CALLAGHAN.

THE New Zealand Loan and Mercantile Agency Co., Ltd., arranged for an exhibition of butter, so as to add interest to the Annual Conference of Factory Managers, which took place in Sydney in June last. The most interesting of the two butter competitions was, undoubtedly, what was known as the "Export" or "Stored" butter class.

Those factories who thought fit entered and competed, having had due notice of the date of the competition, and being, therefore, in a position to manufacture a special butter for the purpose. Only eleven factories competed, and it is rather a pity that the Exhibition was robbed of a great deal of its attractiveness, owing to the fact that very few indeed of our most up-to-date and highest-class factories competed. The conditions of the awards were as follow:—

The butters were judged the day after their arrival in Sydney, and points awarded in each case; they were then put in cold store for two months, and judged again at the end of that period; the prizes going to those competitors who had the highest average score in the two judgings.

It will be seen at once that this was not a true test as to which of the several butters was the best keeping article, because if this was the only factor to be taken into account, the first judging would not have been considered, and would only have been utilised for educational purposes, as, no doubt, a considerable amount of knowledge is imparted by seeing the difference in flavour in the several butters between the first and second judgings.

Thanks to the Director of the Bureau of Microbiology and to the Agricultural Chemist, I am in a position to give factory managers a fairly good interpretation of the causes of the deterioration in the individual butters. There will, of course, be no necessity to refer to texture, or matters other than flavour, as deterioration does not take place in these points until a butter, gets extremely old, when, of course, the texture becomes that of a tallow rather than that of a butter. There was evidence, however, as far as the texture went, that the butters had been kept at a low temperature, and there were no discrepancies in the points awarded for texture between the first and second judging; except in the cases of one or two butters that were too high in temperature when first judged, and hence lost points in texture as a consequence at that judging.

General Remarks.

These butters were judged on the first occasion and awarded points, not with a view to how they would turn out at the end of the storing period, but as they actually were at the time of judging. This is

somewhat different to the method employed in grading butter for export purposes. If the grader notices that, though the butter is of a fairly pleasant flavour at the time of examination, it still contains symptoms of undergoing early decomposition, he will give lower points for flavour than would have been done under the conditions of this Exhibition; simply because of his opinion as to lack of keeping quality. In the case of these butters, however, this was where the educational part of the work came in. The judging of the butters as they stood (regardless of the fact that the judges had evidence which would go to show that the butters would not keep) was an absolute necessity if the work of decomposition was to appear between the points which were awarded at the first judging and those given at the second judging. Practically speaking, the great loss in keeping quality—as shown by the margin of points in flavour between the first and second judgings—really indicates the distinction between a fairly good butter for local consumption purposes, and one which is suitable for export. The former may be sufficiently good to hold its keeping quality for a week, but altogether unsuitable for an export butter, because of its inability to retain its flavour for any length of time. Unfortunately, most of the butters competing at this Exhibition were of the local consumption class rather than the export type; consequently, a great difference is shown between the points awarded at the first judging compared with those awarded at the second judging. This, however, is a great lesson to factory managers as to the necessity of grading their cream on the very best lines, if they are to make a butter which will be successful on the English market.

Causes of Deterioration in the Salted Butters.

Most of the butters exhibited developed fishiness, and it is worthy of note that the bacteriological examinations indicated that these butters would become fishy when stored.

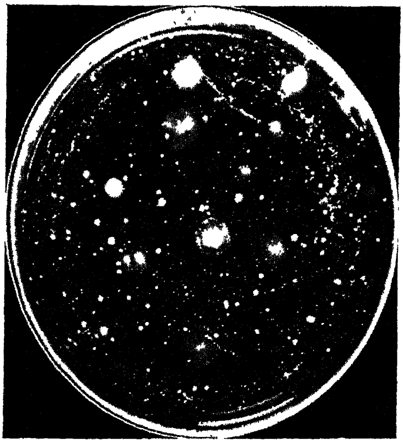
The following butters contained, in greater or less numbers, the small mould *Oidium lactis*, which is one of the factors mainly responsible for the true fishy flavour in butter:—Nos. 2, 4, 6, 7, 9, 10, 11, 12.

Another very injurious germ which was found present in some of the butters was *Bacillus fluorescens liquefaciens*; and, as I have pointed out on previous occasions, this microbe forms a decomposition in butter practically similar to fishiness. It is only a very keen judge who can discriminate between the two.

No. 1 butter was badly affected by this, as well as by another injurious germ, namely, *Bacillus lactis aerogenes*.

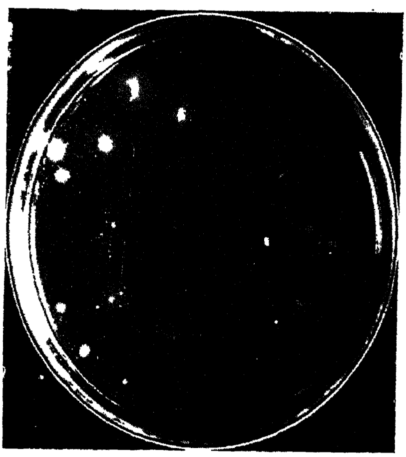
No. 5 showed the presence of that commonly injurious germ in cream and butter, namely, *Bacillus butyricus* (Hueppe).

Nos. 3 and 8 had, undoubtedly, the best history from a bacteriological point of view, and none of the above-mentioned injurious germs were found in either. No. 8 had a rather mixed collection of micro-organisms, but none of them are known to be common sources of butter decomposition.



Butter No. 2, showing *Oidium lactis* prominently.

Butter No. 3, showing nearly all lactic acid bacteria.



Butter No. 4, showing *Oidium lactis* prominently.

Butter No. 5, showing *Oidium lactis* and *B. butyricus* prominently.

MICROPHOTOGRAPHS OF SAMPLES OF BUTTERS EXHIBITED AT FACTORY MANAGERS' BUTTER EXHIBITION.

Butter No. 9, showing some very nice colonies of *Oidium lactis.*

Butter No. 12, showing some very large colonies of *Oidium lactis.*

Siberian butter, showing one colony of *Oidium lactis.*

Danish butter, showing lactic acid germs only.

MICROPHOTOGRAPHS OF SAMPLES OF BUTTERS EXHIBITED AT FACTORY MANAGERS' BUTTER EXHIBITION.

The following table shows the points for flavour obtained by the various salted butters on their first and second judgings:—

No.	First Judging.	Second Judging.	No.	First Judging.	Second Judging.	No.	First Judging.	Second Judging.
1	42	36	5	41	35	9	42	38½
2	44	38½	6	42	41½	10	42	37
3	45	43	7	42	36	11	40	35
4	43	41	8	46½	42	12	44	41½

Some of my remarks at the second judging were as follow:—

1. Appearance, greasy on surface, terribly streaky when bored. Texture, greasy. This is a badly-made butter. It has a mealy, greasy taste, and a flavour somewhat like fishiness.
2. Texture, pretty good, but somewhat greasy. Flavour:—This butter has gone tallowy, with a fishy after-flavour.
3. Texture:—This butter is beautifully made, and worth full points on texture. There is very little free moisture showing, and the colour is good. There is just the slightest trace of a tallowy flavour, which is almost unavoidable in a stored butter, but it leaves a pleasant taste in the mouth. A little more salt would have been of advantage to it. This is the richest and pleasantest fat in any of these stored butters.
4. This is an excellently-made butter, and of good texture. It is very mildly salted, and could have done with a little more salt. Finish and appearance are excellent, and the colour is all that can be required. It has a slight mouldy smell, though there is no mould-growth evident on the paper elsewhere. It has gone somewhat tallowy, but there is no putrefactive decomposition. Flavour, somewhat fishy.
5. This butter stinks badly, as though putrefactive germs had acted on the albuminoids. It is also badly made, and is very streaky. The butter also tastes fishy, and the fishiness is more evident in the taste than in the smell.
6. The surface of this butter, as well as that of No. 4, has a mouldy smell, and it is somewhat fishy. Texture, good, though not equal to that of No. 4; very little free moisture shown. Appearance, a little greasy on trier. Flavour, gone slightly tallowy, but there is no putrefactive decomposition evident.
7. Surface smells fishy. Texture is good; there is no free moisture evident. Colour is rather pale. The texture is inclined to be a little greasy. Flavour:—This butter has become distinctly fishy, and as a consequence is reduced in value about 1d. per lb.
8. The surface of this butter smells better than that of any of the others. Texture, excellent, and will obtain full marks. There was absolutely no moisture showing on the break, though there was a little on the trier. This butter would have been improved with a little more salt. Flavour:—It has a somewhat tallowy flavour. There is no evidence of putrefactive decomposition.
9. Texture of this butter is well made, though not as good as some of those we have had. It looks a little bit greasy in the break, and the taste is fishy, but there is no evidence of any other putrefactive decomposition.
10. This butter shows free moisture, and the moisture shows a slight discoloration, as though the washing had not been perfectly done. The texture is rather open, and exhibits a lot of free moisture. There is also a slight streak appearing right through. It is not nearly so well made as No. 4, and is somewhat greasy to the touch and to the palate. Flavour:—This butter has developed fishiness, and there is slight evidence of putrefactive decomposition, especially in the smell. It is nicely finished, but is a little dull in colour. Surface smells very fishy
11. Smells fishy on the surface. The texture of this butter is distinctly greasy. There is no distinct butter texture, and the break is more of a foreign fat than of a butter fat. Flavour:—This butter is distinctly fishy, both in smell and taste. It is somewhat akin to No. 7, though not as well made a butter. It contains too much salt, and the salt to a certain extent hides the bad taste. There is a very putrefactive smell, in addition to fishiness. It has possibly had *Bacillus fluorescens liquefaciens* in it at some stage.
12. This butter is rather pale in colour, and is somewhat white and greasy on the surface, but the texture is good and worth, practically speaking, full points. It is very like No. 4, but has not gone quite so tallowy. Smells fishy on surface, and is somewhat fishy also in taste.

Temperatures at which these Butters were held.

The following observations were made on the temperatures during the time these butters were in store. They were taken from the cold store two days before the final judging:—

Week ending—	Deg. Fahr.	Week ending—	Deg. Fahr.
22nd April	18	27th May	15
29th „	13	3rd June	11
6th May	19	10th „	9
13th „	16	17th „	9
20th „	10		

It is a noted fact that in every case where the butters had shown a fishy flavour, the mould *Oidium lactis* was found to be present. The judges at this stage did not know the key to the marking, and knew nothing of the microbic examinations. My co-judges were Messrs. T. Mitchell and D. Garrard.

Bacteriological and Chemical Tests.

The following details of the bacteriological examination of each butter have been forwarded to me by Dr. Tidswell, Director of the Bureau of Microbiology. Whilst the examinations are, perhaps, too technical for some factory managers to be able to take full advantage of the information afforded therein, still there are now a large number of our factory managers and their assistants who have had a considerable experience at our various Dairy Science Schools of applied bacteriology and the interpretation of these examinations; and these results will be of special interest to them. Results of the chemical examination are also attached.

I have to draw special attention to the fact that, though allowed the use of ·5 per cent. of boric acid, very few manufacturers utilised this privilege to anything like the full extent, and the keeping quality of their butter suffered thereby.

BACTERIOLOGICAL EXAMINATION.

Sample 1.

1. Total colonies	96,768,000 per gram.
2. Lactic bacteria	96,292,900 „
3. Other bacteria	475,100 „
Including:—*Bacillus lactis aerogenes*, *Bacillus fluorescens liquefaciens*.	
4. Spore-forming species	None.
5. Liquefying species	1,100 per gram.
6. Anaerobic species	None different to above.

Sample 2.

1. Total colonies	4,284,000 per gram.
2. Lactic bacteria	4,171,000 „
3. Other bacteria	113,000 „
Including:—*Micrococcus cremoides*, *Bacillus butyricus*, Yeasts (White), Coliform bacillus, *Oidium lactis*.	
4. Spore-forming species	None.
5. Liquefying species	„
6. Anaerobic species	None different to above.

Sample 3.

1. Total colonies	9,072,000 per gram.
2. Lactic bacteria	9,066,000 ,,
3. Other bacteria	6,000 ,,
Including Coliform bacillus.	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 4.

1. Total colonies	5,292,000 per gram.
2. Lactic bacteria	5,286,500 ,,
3. Other bacteria	5,500 ,,
Including:—*Staphylococcus albus*, *Bacillus butyricus*, *Oidium lactis* (2 types).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 5.

1. Total colonies	4,536,000 per gram.
2. Lactic bacteria	4,386,000 ,,
3. Other germs	150,000 ,,
Including:—*Oidium lactis*, *Bacillus butyricus* (Hueppe).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 6.

1. Total colonies	7,056,000 per gram.
2. Lactic bacteria	6,663,600 ,,
3. Other bacteria	392,400 ,,
Including:—*Bacillus butyricus* (Hueppe), *Staphylococcus aureus*, *Staphylococcus albus*, *Oidium lactis*.	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 7.

1. Total colonies	16,128,000 per gram.
2. Lactic bacteria	15,308,200 ,,
3. Other bacteria	819,800 ,,
Including:—*Staphylococcus aureus*, *Staphylococcus albus*, *Oidium lactis* (2 types).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 8.

1. Total colonies	15,120,000 per gram.
2. Lactic bacteria	12,708,700 ,,
3. Other bacteria	2,411,300 ,,
Including:—*Micrococcus cremoides*, *Staphylococcus aureus*, *Staphylococcus albus*, *Staphylococcus citreus*, pink yeast, white yeast, moulds (*Penicillium*).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 9.

1. Total colonies	9,576,000 per gram.
2. Lactic bacteria	9,575,400 ,,
3. Other bacteria	600 ,,
Including *Oidium lactis* (2 types).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 10.

1. Total colonies	9,324,000 per gram.
2. Lactic bacteria	9,054,100 ,,
3. Other bacteria	269,900 ,,
Including:—*Bacillus butyricus* (Hueppe), *Micrococcus cremoides*, *Oidium lactis* (large type).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 11.

1. Total colonies	41,280,000 per gram.
2. Lactic bacteria	41,279,600 ,,
3. Other bacteria	400 ,,
Including *Oidium lactis* (large type).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Sample 12.

1. Total colonies	12,096,000 per gram.
2. Lactic bacteria	11,979,600 ,,
3. Other bacteria	116,400 ,,
Including:—*Bacillus butyricus* (Hueppe), *Staphylococcus aureus*, *Staphylococcus albus*, Coliform bacillus, *Oidium lactis* (2 types).	
4. Spore-forming species	None.
5. Liquefying species	,,
6. Anaerobic species	None different to above.

Analysis of Twenty-six Show Butters submitted by New Zealand Loan and Mercantile Agency.

Number or Mark.	Percentage of— Moisture.	Curd.	Boric Acid.
1 S 8369	12·11	·79	·31
2 S 8370	12·89	·96	·11
3 S 8371	13·20	1·00	·43
4 S 8372	13·57	1·01	·35
5 S 8373	13·04	·73	·05
6 S 8374	13·50	·71	·23
7 S 8375	13·34	·63	·13
8 S 8376	15·03	·91	·13
9 S 8377	10·59	·63	·33
10 S 8378	13·63	·83	·02
11 S 8739	9·76	·64	·13
12 S 8381	12·18	·78	·43
1 US	11·86	·54	·22
2 US	14·14	·71	·16
3 US	14·33	·56	·36
4 US	14·69	·64	·45
5 US	13·95	·68	·13
6 US	14·51	·72	·13
7 US	14·73	·81	·32
8 US	15·41	·54	·26
9 US	12·99	·56	·44
10 US	14·31	·70	·00 (6)
11 US	14·10	·60	·13
12 US	12·63	·38	·58
Siberian sample	12·55	·64	Nil.
Danish sample	13·78	·62	Nil.

Machine v. Hand-Milking.

J. G. McMILLAN, Dairy Instructor, Hawkesbury Agricultural College.*

EVEN the most enthusiastic dairyman has to admit that the most monotonous part of the industry is the milking. Not that milking can be termed heavy work when compared with other kinds of manual labour; but as it is "the constant drip of water that wears away the hardest stone," so it is the persistence of milking that wearies the average dairyman. No room is left for doubt that it is this that causes the present difficulty in securing sufficient labour. This shortage materially retards the development of the industry, and the dearth of labour, if the increase is to be maintained, must necessarily compel the dairyman to resort to some system whereby he can have his cows milked efficiently and profitably.

The intelligent dairyman knows that in every department of his business there have been, during the last fifty years, revolutionary changes in the system of turning out dairy products—*e.g.*, the advent of the separator has been of incalculable benefit. Any possibility of milking cows by machinery appeals to the average dairyman, yet we find that a great many look askance at any such mechanical method. True, they may have some justification for their conservatism, for doubtless there have been great failures with some types of machines; but it does not necessarily follow that because of past failures the whole system should now be condemned.

Inventors have been at work on the problem for a century or more. In this country, and in several others, various devices have been produced, some of which may be termed successful, and others the reverse. For example, the "Murchland" and "Thistle" milkers, when first used on cows gave very satisfactory results; but curiously enough, after one or two years' use on the same cows they were discarded, because they drew blood. These machines were of the direct-suction type, without any release, so it is probable that the constant suction weakened the capillaries surrounding the follicles in the udder to such an extent that the least strain started the flow of blood. Such plants, however, are now obsolete.

The machines which have been placed on the market of late years are of two types, viz., one operated by pressure on the teats and lower parts of the udder, the other by suction, with manipulation of the udder, in imitation of the sucking of the calf. Allowing a free circulation of air around the teat is of material benefit. If air is kept out, the circulation of the blood is evidently affected, as shown by the limp appearance of the teat after certain types of milking machine have been used.

The credit of bringing the milking machine to its present satisfactory condition is due to a large extent to the ingenuity of a practical Australian dairyman in making certain improvements to an imported machine. Probably some might say that the machine has reached perfection, but we think that many improvements can be made before this word can be applied.

* Now Manager of Wollongbar Experiment Farm.

Although using a certain type of machine at the Hawkesbury Agricultural College, we have an open mind on the question. We do not say that the one in use there is the best—there may probably be many others better—but, in justice to the makers of the machine, we must say that the results are satisfactory. But if it can be shown us that a better machine is procurable, then the College will not be behind in adopting it.

In Victoria, when acting as Travelling Instructor for five years, and as Dairy Instructor at the Hawkesbury College for the past three, I have had good opportunities of drawing certain conclusions on the question of milking by machinery as against hand-milking. The subject may conveniently be divided under the following headings:—

1. The efficiency of machine-milking; the effect of continuous milking on—(*a*) period of lactation; (*b*) quantity of milk; (*c*) quality of milk as regards fat and other solids; and (*d*) subsequent lactations.
2. The influence of the machine on the health of the cow as regards mammary troubles.
3. The influence of the machine on the flavour and keeping quality of milk, cream, butter, and cheese.
4. Its economy as compared with hand-milking.

The question of the thoroughness of the milking will in the end determine the practicability of the machine. It is unfair to condemn mechanical milkers on account of failures by certain dairymen and on certain cows. We are well aware that machines are installed and attended to by hired men generally, who are often hostile to the machine, looking upon it as a competitor in the labour market, and therefore not to their interests to make it successful. Share dairymen are also inclined to look upon it in a similar way.

The cow herself is a factor to be considered, for we find amongst them ultra-conservatives, who are opposed to any change. Such cows will not give down their milk properly to the machine. This, however, might happen to just the same extent with a change of hand-milkers. On the other hand, we find cows that give down their milk to the machine as freely as, and even more so, than they do to the hand-milker.

To obtain success with the machine, it is necessary for the operator to use intelligence; to study the individuality of the cow as regards temper and ease of milking—*e.g.*, it is found that some cows give their milk more freely at first than at the stripping stage. In such a case it is necessary to increase the pressure on the teats by placing a slight weight on the claw, or to manipulate the udder by the "Hugeland" method. On the other hand, we find cows in which the difficulty arises at the first stage, when the operator has to assist the machine until the milk begins to flow.

It is always preferable to allow the same operator to have the same individual cows from day to day. Sometimes it will be found that the more nervous cows of the herd are at first more or less annoyed by the noise of the machine; but after a few days they generally pay but little attention to it. It may be found that the cows do not come up to their usual yield during the first few days they are placed on the machines; but in most instances they soon return to the normal. A change of hand-milkers is

just as liable to have the same effect. In some cases there is no difference in yield, and in many cases the cows will milk not only more quickly, but better, by machine than by hand after once being accustomed to it.

That the cows suffer no pain or inconvenience is evidenced by the way in which they stand chewing their cuds with a tranquil air, and very often "almost go to sleep" during milking.

The shape of the udder is of but slight importance. It is often noticeable that cows with fleshy udders do not give down their milk as freely as those with free, loose udders. The best results are obtained when the teats are of a normal size. If too short and thin, or set too close together, it is difficult to retain the cups on the cows. Teats too large are more objectionable than those too small, because they fill the cup to such an extent that they cause constriction of the teat channel, thereby preventing a free flow of milk. It is with cows with small teats that the milking machine surpasses hand-milking, as it is not only quicker and easier, but probably more efficient. Ayrshires, with small teats, always milk more perfectly with machines than by hand.

We find that the best results are obtained by commencing heifers with the machines, instead of milking for some time by hand and then mechanically.

Stripping the cow is essential where we have fresh milkers on almost every day; and even where there is the same daily operator in private dairies they resort to stripping, considering that it well repays the extra time expended. Certain allegations are made against the machines that, if kept on too long, blood will be drawn. Personally, I have seen no bad effects from the machines in this respect, and there is no record at the College of such when kept on an abnormal length of time.

It is almost impossible to make a comparison between hand and machine-milking for the same cows at the same time. The evidence on this point must necessarily be circumstantial. The comparison has to be made between results from hand-milked cows kept under conditions as nearly as possible similar to those under which the machine-milked cows are kept. To conduct a fairly thorough experiment to ascertain the relative merits would really require two years at least. A number of cows specially selected as regards milking qualities, temperament, &c., as nearly alike as possible, would need to be divided into two sections, one division milked by machine and the other by hand, for one period of lactation. The next period the positions would need to be reversed. The food given for both periods would have to be the same; but as it would be impossible to control certain conditions other than those mentioned, even such an exhaustive test would not be conclusive.

At the Hawkesbury Agricultural College a short test was made with eight cows for two weeks, divided into two sections; one lot milked by hand the first week, and by machine the second, and *vice versâ.* Unfortunately the test was made at a time when most of the cows were drying off. The reader, in perusing the table, has to bear in mind the effect that the change of milker has upon the production of the cow, and must make allowances accordingly.

Cows Nos. 29, 304, 188, and 65 were milked by machine previous to the test. It will be noted that when transferred to hand-milking the fall was slight. Of course it might be said that they were used to hand-milking as well, by reason of the stripping. It will be noticed, however, that there is a slight difference in the average fat percentage in favour of the machine-milked in respect of these four cows.

Cows Nos. 47, 145, 19, and 70 were immediately transferred from the hand-milking to the machine-milking side of the bails after the first week of the test. The moving from one side to the other would have a detrimental effect, in addition to the change of system of milking. None of these latter cows had been milked by machine this season, but were the previous one. A further table shows that during the second week of milking by machines the decrease was proportionately less, indicating that the cows were becoming accustomed to the method.

The amount of strippings from the different cows varied considerably, but on the whole the difference between the two lots was but slight. In the cases of Nos. 29 and 65, 6 lb. and 4 lb. respectively of strippings are recorded as the highest amount at any particular time. The reason for such high quantities is the fact that the cows were in season, and thus unduly excited. It will also be noted that the lowest quantity of strippings was 0·25 lb., the difference being principally due to the different operators, and the time which the machine was left on the cow.

Allowance must also be made in the tables for the natural decrease due to nearing the end of the lactation period, cows Nos. 47, 19, and 70 having been in milk for seven or eight months. Cow 304 only recently had her first calf.

The results of the tests are given on page 868. The following is a summary:—

Cow No.	May 8th to 14th inclusive.		May 15th to 22nd inclusive.	
	Machine-milked.		Hand-milked.	
	Milk.	Fat.	Milk.	Fat.
	lb.	lb.	lb.	lb.
29	169·75	5·4555	168·5	4·9345
304	189·5	8·212	186·0	7·4825
188	117·0	4·0403	108·5	4·031
65	143·0	4·8472	144·5	4·2322
Total ...	619·25	22·555	607·5	20·6852
Average yield	154·8	3·64 %	151·87	3·4 %
	Hand-milked.		Machine-milked.	
47	130·5	4·757	98·25	3·479
145	177·5	6·392	142·0	4·9412
19	102·0	5·323	77·5	3·8975
70	144·0	5·430	116·25	4·281
Total ..	554·0	21·902	434·0	16·5987
Average yield	138·5	3·95 %	108·5	3·82 %

MILK YIELD FOR SEVEN DAYS IMMEDIATELY SUCCEEDING END OF TEST.

Cow No.	Milk.
	lb.
29	154
304	182
188	91
65	128
47	79
145	119
19	59
70	101

It will be noted that the average results here given from all the cows included in this trial furnish comparable data as to the immediate influence of the change from hand to machine-milking, with the average weekly yield of the milk for the trials under review. There was a somewhat greater decrease of milk during the period of machine-milking than that immediately preceding the change in the method of milking.

A very important question arises, and that is the effect of the continued use of the machine on milk secretion. A great many dairymen allege that after an extended period of machine-milking the secretion is adversely affected. One user of the machine in Victoria, over a period of five years, has had cows milk down to it for three seasons, and then have to be hand-milked for a season before they would settle down to machine-milking again.

At the Hawkesbury Agricultural College, however, we have cows that have been milked continuously for five years by the machines without any noticeable effect on the quantity of the milk from year to year. Cows that were milked for two years by machines, and then by hand, are still milking well; and others, milked by hand and then by machine, are milking, on the whole, satisfactorily. Certainly there are individual cows that, owing to their peculiar temperament, are unsatisfactory.

We do not find that the length of the lactation period is shortened; in fact, the machine-milked cows continue longer in milk than the others, and are generally more difficult to dry off. This is also the experience of other dairymen. The machines have been in use at the Hawkesbury Agricultural College for nearly nine years continuously.

The percentage of fats and other solids in the milk drawn by the machines is as high as that drawn by hand, as shown from weekly analyses of College milk.

The Influence on the Udder and its Parts.

We are satisfied that the action of the milking machine has no ill effect upon the health of the cow; nor is the form, texture, or quality of the udder altered. Allegations have been made against the machine that it is a transmitter of diseases peculiar to the mammary glands. Our experience at the College is that we have had fewer cows suffering with mammitis

that were milked by machines than of those milked by hand. As an example, two years ago we had thirty-five cases of mammitis at one time, and only one animal that was milked by machine contracted the disease, although as soon as a case was noticed the animal was immediately isolated. The greatest care was also taken, the udders of the hand-milked cows being washed with water containing lysol, as also were the hands of the milkers. Probably, if machines are kept in a dirty state, disease will be conveyed. Our opinion is that, when milked under proper conditions, it is unfair to charge mechanical milking with being a cause of mammitis, at least as far as the particular machines we use are concerned.

Another great advantage of the machine is that cows have seldom been found suffering from sore teats.

Influence on Flavour and Keeping Quality of Milk, Cream, Butter, and Cheese.

The milking machine has been condemned for the reason that the milk is of worse flavour and keeping quality than that obtained by hand. *If properly cleansed,* there is absolutely no comparison between the keeping qualities of machine and hand-drawn milk, obtained under the cleanest conditions. The machine milk has been proved to be very much cleaner. As proof of this, we have only to quote bacteriological tests of milk sold by the Lady Talbot Institute, in Melbourne. In New York, the maximum number of organisms in certified milk is 30,000 per c.c., which must not be exceeded to obtain the endorsement of the Milk Commission of the Medical Society of New York. At the Lady Talbot Institute milk has varied from absolutely sterile up to 200, and occasionally up to 2,000 organisms per c.c. It is therefore evident what can be done with milking machines, *plus cleanliness,* in supplying a city with pure milk.

Certain milk-condensing factories we know of refuse to accept milk that is drawn by machines. The manager of a local condensing factory informed me that the reason was not that they were against the machines, but they consider that dirty hand-milking is preferable to dirty machine-milking.

With regard to the effect on cream, we may quote an extract from a letter by a Victorian factory manager to one of his suppliers, in which he says:—

> We found the cream in good condition and free from taints of any kind. Personally I have been opposed to the milking machines since they were introduced here; but if one farmer can produce cream without the rubber taint, then it must be the fault of the farmer and not of the machine.

Of course, if the cream is tainted the butter will also be; and on this subject I would advise a close perusal of Mr. Pedersen's article in the June number of the *Agricultural Gazette* for this year.

With cheese, no bad effect is experienced, because where no hand-milking is resorted to the most perfect-flavoured cheese can be produced. As an example of this, Messrs. Noel Bros., of Noorat, Victoria, obtained champion prize at the A.N.A. Exhibition in Melbourne, in January, 1907. The milk for this cheese was drawn entirely by machines.

We have every reason to believe that, where thorough cleanliness is practised, a first-class dairy product can be obtained; and we can go so far as to say, an even better product than with hand-milking under allied conditions.

Economy.

The economical side of the question is of importance to the practical dairyman. Any system that will reduce the labour bill, coupled with efficiency, generally appeals to him. With hand-milking, the man who is capable of milking eight cows in full milk per hour is doing good work. We hear of individuals who can do anything from ten to twelve cows per hour, and as high even as twenty. Such milkers, however, are far more the exception than the rule.

With a double milking machine, a good man is capable of doing sixteen to eighteen cows per hour in full milk, and in the later stages of lactation from twenty to twenty-two per hour. The usual method practised with a two-machine plant is to allow one man to attend to the machines and another man or boy to bail up the cows, prepare them for the machine, and do the stripping. It is best to have two sets of double bails for every machine where the double machine is used, and considerable time is saved by having an extra milk-pail, so that when a pair of cows are completed the spare milk pail is between them, ready to receive the pulsator and cups; and whilst the operator is weighing and emptying the milk of the previous cows the work is going on. In this way there is nothing to hinder a man and a boy from doing at least sixty-six to seventy cows in two hours. Even as many as eighty cows are milked by two operators. To do the same number of cows in the same time by hand would require four men averaging about eight or nine cows per hour.

Cleanliness.

The chief cause of failure in mechanical milking is improper cleansing of machines. The main object of the dairyman should be to produce a raw material from which the factory manager can manufacture a first-class article. Undoubtedly the cleaning of the machines entails a considerable amount of work. Our method is that, immediately after use, cold or luke-warm water is sucked through the tubes by means of the vacuum, to remove any milk that may adhere to the rubber, &c. Then the parts with which the milk comes in contact are soaked for some time in fairly hot water containing soda, and, after a thorough scrubbing with specially constructed spiral brushes, the parts are boiled for about ten minutes in water containing about 1 per cent. of washing soda. They are then placed in a solution of lime-water until the following milking, and just previous to being used, boiling water is run through them.

Many dairymen hold the idea that boiling the rubber destroys it, but such a theory was long ago exploded.

If a sound product is to be obtained from the milk, every part with which it comes in contact must be rendered sterile. Lime-water, in addition to preserving the rubber, keeps it sweet, and we find it a good plan before using new rubber parts to allow them to remain in water for several days, which, to a great extent, removes the rubber flavour.

Attention should also be given to the other parts of the machine, to see that every mechanical part is kept in good condition. Special attention must be given to the pulsator, keeping it free from grit and properly lubricated. The pulsator should not be allowed to go too fast, for, in addition to causing extra wear, the milking is not so thorough. Some people imagine that the faster the pulsator goes the more quickly the milking is done; but this is erroneous, because when going too rapidly there is insufficient release, and therefore the teat channel is partially constricted. A steady, rather slow stroke is the best. The cleansing of two machines need not occupy more than twenty minutes each day.

Cost of Working Machines, as compared with Hand-Milking.

The general rule where milking machines are used is to work them for only about eight or nine months of the year. Practical dairymen consider that it is hardly worth while to work the machines when the cows are drying off. The cost of running a two-machine plant for the milking period, with an oil-engine as power, is about 1s. 4d. per day in the busiest season. When steam power is used the cost is much about the same where wood is cheap; but where there is a scarcity of fuel the oil-engine is generally found the cheaper, and, in addition, there is no time lost in getting up steam in the morning. On the other hand, there is a disadvantage in that a heating plant for production of boiling water is required.

To obtain accurate results comparable with our own, I made inquiries from two well-known Victorian dairymen, who, in addition to being successful stock men, have a good knowledge of machinery, viz., Messrs. Hennessey, of Bena, and Eccles, of Glenormiston. The former uses steam power, and states that the actual cost of running two machines for the season of eight months is £3 2s. for renewals and £12 7s. 6d. for fuel. The actual time of milking seventy cows was four hours per day. Separating and getting up steam is included in the cost of fuel. For the previous season the cost was slightly higher for renewals, namely, £4 0s. 4d., but this included four milk-tubes at 7s. 6d. each, the previous set having lasted four years.

Mr. Hennessey has both vacuum pump and steam ejector for working the machines, and considers the latter slightly the cheaper. Less fuel is used, and in addition there are no working parts.

Mr. Eccles states that it costs him 1s. per week for each machine to milk seventy cows. The oil-engine costs him 7s. per week during the busy time, and 5s. per week during the slack. He does not consider that the machines have any effect on subsequent periods of lactation, as he has cows that have been milked by machine for six years, and they are as sound as when he bought them. He and his son work the machines.

The cost of a two-machine plant, including vacuum pump, boiler, engine, &c., will be from £170 to £180. An oil-engine plant, in addition to a small boiler for generating steam for cleansing purposes, will cost somewhere about the same. It would be evidently unfair to make a charge for interest and depreciation against the milking side of the dairy entirely, because the engine and boiler can be used for other purposes. If we were to allow a total amount for depreciation of 10 per cent., and charge about seven-tenths of that against the milking machines, and also about 3 per cent. on the capital invested, we would arrive at a fairly definite conclusion. Taking these costs into account, it can be estimated that there is a saving of 10s. to 12s., as a minimum estimate in the cost of milking a cow in a season, in favour of machine-milking as compared with hand.

Of course, many things have to be taken into consideration. For example, the men can be used for extra work on the farm. Still, when milking about twenty cows each twice a day, separating, &c., little time is left for extra labour. The larger the number of cows, the less the cost per head will be, as very little more machinery is required to run a 100 to 120 cow dairy. Finally, the fact that the work is more congenial when the machine is used plays an important part.

General Conclusions.

1. That machine-milking, in the hands of a capable operator, may be considered as successful as the best average hand-milking.

2. That the flow of milk is not appreciably decreased when machine-milking is substituted for hand-milking, except in isolated cases.

3. That the period of lactation is not shortened.

4. That subsequent periods of lactation are not adversely affected.

5. That the composition of milk as regards solids is not lowered.

6. That cows are no more subject to udder troubles than when milked by hand, if machines are properly cared for.

7. That the milk is cleaner and purer if the machines are kept as they should be.

8. That machine-milking is cheaper than hand.

An improvement might be made so that by some automatic arrangement the amount of milk from each cow could be recorded with less trouble than is now the case with the double machine. On account of the time required in weighing the milk with double machines, I would advise the use of the single milkers, believing that the process can be done more quickly.

Finally, we strongly advise that in working milking machines the owner of the dairy or some interested person should be in control; otherwise the best results will not be obtained. A dairyman should also be extremely cautious in allowing inventors of new machines to experiment upon his cows.

TABLE SHOWING COMPARATIVE YIELD OF COWS MILKED BY HAND AND BY MACHINE, HAWKESBURY AGRICULTURAL COLLEGE.

Machine-milked.										Hand-milked.					
Cow No.	Actual Milk drawn by Machine in one week.	Strippings.	Greatest amount of strippings in one milking.	Lowest amount of Strippings in one milking.	Total Milk.	Fat.	Average Fat.	Lowest Fat.	Highest Fat.	Cow No.	Total Milk drawn in one week.	Fat.	Average Fat.	Highest Fat.	Lowest Fat.
	lb.	lb.	lb.	lb.	lb.	lb.	per cent.	per cent.	per cent.		lb.	lb.	per cent.	per cent.	per cent.
29	145·5	24·25	6·0	0·25	169·75	5·4555	3·21	2·4	3·47	29	168·5	4 9345	2·92	3·2	2·73
304	184	5·5	0·5	0·25	189·5	8·212	4·33	4·05	4·52	304	186	7·4825	4·02	4 62	3·46
188	113	4·0	0·5	0·25	117·0	4·0403	3·45	2·9	4·07	188	108·5	4·031	3·71	4·14	3·25
65	126	17·0	4·0	0·25	143·0	4 8472	3·89	2·6	3·82	65	144·5	4·2372	3·14	3·34	2·96

Hand-milked.						Machine-milked.									
Cow No.	Total Milk drawn in one week.	Fat.	Average Fat.	Highest Fat.	Lowest Fat.	Cow No.	Actual Milk drawn by Machine in one week.	Strippings.	Greatest amount of Strippings in one milking.	Lowest amount of Strippings in one milking.	Total Milk.	Fat.	Average Fat.	Highest Fat.	Lowest Fat.
	lb.	lb.	per cent.	per cent.	per cent.		lb.	lb.	lb.	lb	lb.	lb.	per cent.	per cent	per cent.
47	130·5	4·757	3·64	4·26	3·4	47	85·75	12·5	2·0	0·25	98·25	3·479	3·54	4·17	3·0
145	177·5	6·392	3·60	3·89	3·2	145	136	6	1·0	0·25	142·0	4·941	3·47	3·7	3·3
19	102·0	5·323	5·21	6·72	3·92	19	60	17·5	2·0	0·25	77·5	3·897	5·02	6·05	3·79
70	144·0	5·430	3·77	4·06	3·4	70	101	15·25	3·5	0·25	116·25	4·281	3·68	3 94	3·02

Farmers' Experiment Plots.

Summer Crops, Season 1910–11.

NORTH COAST EXPERIMENTS.

GEORGE MARKS, Inspector of Agriculture.

These experiments comprised a trial of varieties of maize for grain, and varieties of maize, sorghums, millets, and cowpeas for green fodder. Plots were selected in nine centres on the North Coast, upon the following farms :—

Murwillumbah	A. J. Brown.
Casino	C. Crowther.
Myrtle Creek	F. Scott.
Kempsey	B. J. Toohey.
Rawdon Island	J. Warlters.
Long Flat	R. Henry.
Stewart's River	F. Longworth.
Jones' Island	A. Perritt.
Wingham	J. Allan.

Unfortunately, the season was such that the results obtained are not comparable on all the plots. During the early part the weather was very dry, which did not permit of the land being broken up properly. All the plots, excepting those at Jones' Island and Stewart's River, suffered severely through dry conditions setting in shortly after planting. In January, heavy rains fell, which continued at regular intervals for three months. As a consequence, the plots at Murwillumbah, Casino, Myrtle Creek, and Wingham were flooded several times, and the land kept in a saturated condition for weeks at a time.

The rainfall for the period during which the experiments occupied the ground ranged from 40 to 60 inches. The wet weather during the early portion of this year had a bad effect on the crops, and from this cause large quantities of grain were damaged in the field. During January and the early part of February the rain averaged an inch a day for six weeks running. It was not possible to harvest the crops until several weeks after they matured. Funk's Yellow Dent suffered severely in consequence, and being somewhat short in the husk, the rain gained access to the cob. That is partly the reason why this variety gave such light yields.

The bulk of the maize lands on the North Coast are situated on the low alluvial flats adjacent to the rivers, where the natural drainage is not effective in dealing with the heavy autumn rains. Many of these areas could be vastly improved by a thorough system of drainage, and the cost of this, in many instances, need not make it an expensive undertaking.

Maize for Grain.

Though the results of all the plots are not comparable, *Yellow Dent* holds its own as a grain yielder. *Funk's Yellow Dent*, though giving light returns, is a very early variety, and should prove suitable for early planting. It also suffered badly from the ravages of weevil, but this happens to most varieties that mature during the hot weather.

On four of the farms—Murwillumbah, Kempsey, Rawdon Island, and Jones' Island—the local or farmers' variety was planted in addition to those supplied by the Department, and though they were also affected by unfavourable weather, still all the varieties had the same conditions at each locality, and it is interesting to note that in every instance the local variety did not reach that of one or other of those supplied by the Department. The differences ranged from 3 to 41 bushels per acre. Taking a mean of 20 bushels, with maize at 2s. 6d., this represents a sum of £2 10s. The cost of producing the heavier crop is practically the same, excepting a slight increase in harvesting, husking, and shelling ; so that it will be seen at a glance that it is very easy to suffer loss by not planting the variety best adapted to the locality. If the farmers' experiments demonstrate that increased returns can be produced from a few acres, it is only reasonable to suppose that, with similar conditions, a corresponding increase may be obtained from a much larger area. It would appear that large areas of maize-growing lands are not giving the returns they should, through insufficient attention being given to the selecting of seed and suitable varieties.

The size of the plots ranged from ¼ to ½ an acre, but for convenience the tabulated returns show the yields per acre. Unfortunately, the plots at Long Flat were harvested by employees in mistake, and mixed with the bulk, so that it was impossible to obtain their respective yields.

Green Fodder Trials.

Maize.

In these trials, *Yellow Dent* also came out on top, yielding as high as 31 tons per acre, at Jones' Island. This shows that a few acres devoted to this crop will produce sufficient feed, if properly conserved as silage, to tide over any drought or dry winter, or to increase the stock-carrying capacity of the farm. The average dairyman has yet to learn the value of silage and the growing and proper conservation of fodder crops for his herd. When he does, maize will form the principal crop for this purpose. It is easy to grow, produces heavy returns, and is very economically handled.

At Stewart's River, fertiliser applied at the rate of 1½ cwt. per acre gave an increase of nearly 4 tons of green fodder. The effect of the fertiliser was noticeable throughout the growing period, both in amount of growth and in colour.

Sorghums.

The results of these trials show conclusively that *Planter's Friend* is the best. On the Manning, Early Amber Cane and *Sorghum saccharatum* were badly affected by a blight. This disease, however, is not new to the district. A large area of sorghum planted for winter feed in the district was rendered useless for fodder purposes from this cause. The sorghums were planted in drills 3 feet apart. This crop is also easy to grow, and gave as high as 30 tons of green fodder per acre.

Cowpeas.

Cowpeas were planted with maize and sorghum in the green fodder trials. In almost every instance they were a failure. This is due mainly to the excessive rains and saturated condition of the land, but also to the fact that the maize and sorghums were planted in drills 3 feet apart, and moderately thick in the drills. At Rawdon Island, Black cowpeas yielded over 12½ tons of green feed per acre, and White cowpeas over 8½ tons. The rain completely spoilt the yields of the plots planted for seed.

Millet.

Plots of Hungarian and Manchurian millets were planted, and at Murwillumbah and Rawdon Island, substantial increases were obtained from the latter variety. It was impossible to estimate their grain-yielding qualities on account of the devastations caused by birds.

Fertiliser Trials.

Trials were made of fertilisers in the grain and green fodder trials. The manure was made up as follows :—

3 parts dried blood.
2 ,, bone-dust.
4 ,, superphosphate.
1 part sulphate of potash;

and applied at the rate of 1½ cwt. per acre.

Varying results were obtained in the trials, but on account of the unfavourable weather conditions and excessive rains, it would be misleading to compare them. In the green fodder trials there were, with one exception, increases when the fertiliser was applied; but even here it would also be unfair to compare all the plots. In most instances there was no appreciable difference visible in the plots during growth.

Appended are the tabulated results.

North Coast Experiments with Summer Crops—Season, 1910–11.

Varieties.	Murwillumbah.	Casino.	Myrtle Creek.	Kempsey.	Rawdon Island.	Stewart's River.	Jones' Island.	Wingham.	No. of Trials	Average Yield.
Maize for Grain—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.		bus. lb.
Early Leaming	52 20	41 32	46 0	45 35	58 20	....	85 19	45 0	7	53 26
Red Hogan	53 32	48 32	41 52	70 35	64 24	....	71 29	41 2	7	55 55
Funk's Yellow Dent	16 0	18 12	37 4	31 49	30 24	....	...	...	5	26 42
Yellow Dent	37 52	23 8	50 4	71 34	52 24	....	98 50	48 8	7	54 34
Boone County Special	....	....	...	60 45	....	....	....	....	1	60 45
Farmers' Variety—Hickory King		....	....	59 11	43 44	....	57 24	...	} 5	49 15
Do Large Yellow	20 28	....	....	....	55 28	....	....	....		
Green Fodder Trials—	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c q. lb.	t. c. q. lb.	t. c. q. lb.	t c. q. lb.	t. c. q. lb		t. c. q. lb.
Yellow Dent (unmanured)	22 17 2 20	10 0 1 12	15 0 2 24	...	21 10 0 0	21 8 0 24	30 18 3 0	....	6	20 5 3 22
Yellow Dent (manured)	21 12 0 16	14 8 3 0	17 7 2 20	....	....	25 0 3 16	31 0 2 24	..	5	21 18 0 4
Yellow Dent and Cowpeas	23 1 2 12	13 7 0 16	16 10 0 0	...	24 11 0 8	....	....	...	4	19 7 1 23
Red Hogan	21 12 0 16	14 2 2 12	..	....	23 11 1 20	21 8 0 24	26 4 1 24	...	5	21 7 3 2
Cocke's Prolific	..	...	....	...	19 12 3 12	...	22 15 2 24	....	2	21 4 1 4
Marlboro Prolific	17 3 3 0	11 0 0 0	....	...	18 13 0 24	17 9 2 16	20 6 2 12	...	5	16 18 2 16
Yellow Moruya	....	....	....	....	....	19 18 3 0	....	....	1	19 18 3 0
Farmer's Variety—Hickory King	16 11 3 24	9 16 1 20	..	....	....	19 14 2 16	21 0 1 12	....	4	16 15 3 11
Planter's Friend (unmanured)	15 16 1 0	23 5 2 24	13 15 0 0	....	21 10 0 0	....	28 13 2 18	....	5	20 12 0 14
Planter's Friend (manured)	16 0 0 20	25 10 2 24	27 10 0 0	...	...	...	30 8 3 20	.	4	24 17 1 23
Planter's Friend and Cowpeas (unmanured)	25 14 2 16	22 1 3 24	25 14 2 16	....	23 3 2 8	....	....	....	4	24 3 2 23
Planter's Friend and Cowpeas (manured).	19 10 3 16	23 1 2 12	27 19 3 8	..	...	...	...	....	3	23 10 3 2
Early Amber Cane	....	....	...	...	23 11 1 20	...	21 12 0 16	....	2	22 11 3 4
Sorghum saccharatum	....	....	....	...	17 13 2 8	....	8 12 3 12	....	2	13 3 0 24
Black Cowpea	....	....	....	...	12 11 1 20	....	...	....	1	12 11 1 20
White Cowpea	....	...	...	..	8 12 3 12	..	...	.	1	8 12 3 12
Hungarian Millet	3 4 3 2	...	....	...	5 13 3 20	..	...	....	2	4 9 1 11
Manchurian Millet	14 7 3 12	..	...	....	7 9 1 4	...	....	...	2	10 18 2 8

Fertiliser Trials.

Maize for Grain.

Plots.	Varieties.											
	Early Leaming.		Red Hogan.		Funk's Yellow Dent.		Yellow Dent.		Local Large Yellow.		Hickory King.	
	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.	Manured.	Unmanured.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Rawdon Island	53 40	58 20	62 40	64 24	36 4	30 24	54 52	52 24	65 28	55 28	50 52	43 44
Kempsey	......	.....	......	......	......	......	74 31	71 34	.....	......	......	......
Jones' Island	......	......	.....	.....	....	......	100 34	98 50	.....	......	......	......
Wingham	....	......	.....	......	.....	......	42 0	48 4	.....	......	......	.....

FORAGE TRIALS IN THE NORTH-WEST DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.

EXPERIMENTS were conducted during the past season in the New England district with maize, sorghums, millets, and cowpeas, to demonstrate the relative value of each, and to ascertain the most suitable varieties for cultivation in that district.

The season was not altogether favourable to the growth of forage crops. During the early months dry weather prevailed, which hindered germination to some extent, while the exceptionally heavy rains in January and February retarded growth. The wet, cold summer proved conclusively that some of these forage crops cannot develop in the absence of warmth and sunshine. For instance, sorghums did very poorly, while cowpeas were even more affected, the germination being low, and even the plants which grew made very little headway. In the past cowpeas have done fairly well in parts of New England, but in the present season they were a complete failure, and no yields could be obtained. This was altogether attributable to the weather conditions.

Sorghum was only tested on one plot, but was practically a failure, partly owing to the season, but also to the fact that it was sown on poor granite country.

Maize proved itself by far the best forage crop. The wet condition of the land for a considerable time in the summer months, combined with low temperatures, did certainly retard growth, but not so seriously as to cause any material loss.

Millets did fairly well where tried, but the yield did not compare at all favourably with that from maize. Some varieties did better than others, the Manchurian millets returning the best yields. Judging from the results, millet is not likely to be cultivated very largely, as maize returns more fodder per acre, and is much easier to handle.

The forage from the experiment plots was conserved in the form of silage. At Uralla a stack was made, while at Tenterfield a pit was excavated and the material packed in it. When the pit was filled the stack was continued upwards, thus making it a combination of stack and pit.

The pit was 13 feet 6 inches by 10 feet 6 inches, and 9 feet deep. The sides were made perpendicular. After the pit was filled and the stack finished, the sides of the stack were cut down with a hay knife, so that as shrinkage took place the material would go straight down into the pit. After it was completed, earth, heavy poles, and stones were used to secure the right pressure.

A portion of the crop was left over, and a small stack was built on the surface. This was also weighted with earth. The latter stack was opened up in June, and turned out splendidly. The pit has not yet been opened.

At Uralla the stack was made about 12 feet square and 9 feet high. After it was completed earth was used to exclude the air through pressure. The crop that went into this stack was at different stages of maturity. Some was rather too mature and dry, whilst some was green and sappy, and had

not reached the seeding stage. It was very noticeable when the stack was opened that the green material had produced the best silage. It was well preserved and very palatable, while the drier material, although placed in alternate layers with the green material, had not cured too well. On the whole, the silage in this stack came out very well.

The following are the yields of the different crops :—

FORAGE TRIALS IN NEW ENGLAND, 1910–11.

URALLA.—Sown 19th October, 1910.

Variety.	Manure per acre.	Yield per acre.
Maize :—	cwt.	tons cwt.
Yellow Moruya	M1, 1½	5 1
Yellow Dent	M1, 1½	7 5
Yellow Dent	Nil.	3 16
Hickory King	M1, 1½	6 6
Red Hogan	M1, 1½	6 15
Millet :—		
White Manchurian	.. ..	2 7
Yellow Manchurian	....	3 17
Cowpeas	....	Failed.
Sorghum	....	Failed.

The harvesting was done on 13th March, 1911. The yield is that of green stuff.

TENTERFIELD.—Sown 16th November, 1910.

Variety.	Manure per acre.	Yield per acre.
Maize :—	lb.	tons cwt.
Early Leaming	130	7 7
Red Hogan	130	10 7
Yellow Moruya	130	10 12
Hickory King..	130	7 1
Funk's Yellow Dent	130	8 17

At Uralla the beneficial effect of fertilisers was very apparent. It was plainly observable to the eye, and in the weights it is shown that the fertilisers almost doubled the yield.

It was noticeable that the later varieties gave the best yields. This was in part due to the peculiarities of the season. After the heavy rains of January and February fine warm weather prevailed, and the late sorts flourished, while the early sorts had pretty well reached maturity and were stunted. It is probable, however, that in any season midseason or late varieties will be found the most suitable for forage, as the longer period of growth results in a heavier yield.

Red Hogan was, on the whole, the most satisfactory variety. It yielded well, and was not too coarse in the stalk. This is a most important feature when the crop is to be converted into silage, as the material packs more closely, and the consequent better exclusion of air favours proper preservation.

Funk's Yellow Dent and *Early Leaming* are also valuable. They make about the same amount of growth and mature about the same time. They are also fine in the stalk.

Yellow Moruya returns a fine yield. It is a tall variety, and produces abundant leaves. Thick sowing must be practised, otherwise the stalks will be too coarse.

Hickory King is a good forage variety. The yield is good, and the stalks not too hard nor coarse.

Early Yellow Dent yields fairly well. It is a good early variety, but where the length of the growing season does not count for much, later varieties will be found more satisfactory.

White and Yellow Manchurian millets made fairly good growth. The Hungarian variety gave a very poor yield. Millets do not appear to be very satisfactory in New England, as better crops of maize can be grown, and the latter is a superior food.

EXPERIMENTS WITH MAIZE FOR GRAIN, NORTH-WEST DISTRICT, 1910-11.

A. H. E. McDONALD, Inspector of Agriculture.

EXPERIMENTS were made at Singleton and Inverell. The soil at Singleton was good alluvial, well drained, but at Inverell, although fairly rich, it was badly drained, and the dampness and coldness caused the yields to be small.

Taken on the whole, the season favoured the later maturing varieties. The early portion was rather dry, but in January and February splendid rains fell. These two months were exceptionally wet and cold. This to some extent interfered with the yields of the early sorts, but did not affect the later kinds, as fine weather returned about the time they reached the grain-forming stage.

The following are the yields :—

SINGLETON.

On the farm of Mr. Holz.

Variety.	Date sown.	Yield per acre.	Remarks.
	1910.	bush. lb.	
Early Leaming	7 December ...	62 0	No manure.
Funk's Yellow Dent	7 ,, ...	71 42	do.
Farmer's Variety	7 ,, ...	50 12	do.
Early Yellow Dent	7 ,, ...	62 0	Manured.
Boone County Special	7 ,, ..	63 4	do.

The seed was sown by hand in drills 4 feet 6 inches apart. Each variety occupied a little more than an acre. The Farmer's Variety was an early maturing yellow soil. The cobs were of medium size, well filled, with a fairly deep grain.

The germination of Early Yellow Dent was not quite satisfactory.

INVERELL.

On the farm of Mr. G. Arkinstall.

Variety.	Date sown.	Yield per acre.	Remarks.
	1910.	bushels.	
Early Leaming ...	27 October	30½	Manured.
Early Leaming ...	27 ,,	21	Unmanured.
Pride of the North	27 ,,	16½	Manured.
Early Yellow Dent	28 ,,	13⅜	do.
Funk's Yellow Dent	28 ,,	27½	do.
Iowa Silvermine ...	28 ,,	28½	do.

The manure was applied at the rate of 1½ cwt. per acre. Eight lb. of seed were sown per acre, in drills 4 feet apart. The area of each plot was ⅓ of an acre.

The germination of Pride of the North and Iowa Silvermine was rather poor, and the results from these are scarcely comparable with those from other varieties.

The results of the test with fertilisers are very interesting. During the growth of the crop there was no noticeable difference between the manured and unmanured plots; but when the weighings were made, it was found that the yield where the fertiliser was applied was 9½ bushels per acre greater than where no fertiliser was applied.

The Varieties.

Early Leaming.—This is a rather late yellow variety. The cobs are of fairly good size, somewhat tapering, with fairly deep grain. It ripens about the same time as Funk's Yellow Dent, but although at Inverell it gave a higher yield, it is not quite so satisfactory as that variety. At Inverell it had rather more favourable conditions than Funk's Yellow Dent. At Singleton, Funk's Yellow Dent gave 9½ bushels more per acre.

Funk's Yellow Dent.—This, as before mentioned, is a late variety. The cobs are large, with fairly deep, reddish-yellow grain.

Early Yellow Dent.—This is a very good early variety. The cobs are a little above the medium size, and are very uniform. The grain is a nice yellow, and fairly deep.

Pride of the North.—The cobs of this variety are not quite so large as those of Early Yellow Dent. It matures at about the same time. The grain is fairly deep, and pale yellow in colour.

Iowa Silvermine.—This is a fairly early kind, but is later than the two last-mentioned sorts. The cobs are fairly large. The grain is ivory white, wedge-shaped, and deep.

Boone County Special.—This is a very late variety. The cobs are very large. The grain is white, very large, and deep.

FORAGE EXPERIMENTS IN SOUTHERN DISTRICT.

H. ROSS, Inspector of Agriculture.

It has been so frequently and abundantly proved in this State that the growth of some kind of fodder crop is an indispensable necessity in connection with the dairying industry, that the real object of establishing forage

experiment plots was not so much to point out the advantages of such a crop as to ascertain which is the most profitable crop to grow. Still, though it is the custom of many dairymen to grow some class of feed to supplement the ordinary pastures, the practice is by no means as universal as it should be. The crop most commonly grown is maize; but the experiments just concluded indicate that maize is by no means the most profitable crop in this part of the State.

Experiments with summer fodders were carried out in two localities totally distinct from each other in regard to soil and climatic conditions, *i.e.*, Tumbarumba and Deniliquin, yet the results in the main are very much the same. Early Amber Cane in each case yielded a considerably heavier bulk of green feed than *Sorghum saccharatum*, Planter's Friend, or any of the maize varieties.

The soil of the Tumbarumba plot, situated on Manus Estate, the property of Messrs. McMicking & Co., is a representative sample of thousands of acres in that locality. The land was ploughed 7 inches deep, and worked down with harrows to a fine tilth. The seed was sown in the middle of November with an ordinary seed and manure drill, in rows 2 feet 6 inches apart. The maize was sown at the rate of 20 lb., and *Sorghum saccharatum*, Planter's Friend, and Early Amber Cane at the rate of 10 lb. per acre.

A complete fertiliser, containing nitrogen, phosphoric acid, and potash, was sown with the seed, at the rate of 1½ cwt. per acre. For comparative purposes part of the field was left unmanured.

The plot was harvested at the end of March, with the following results:—

Variety.	Yield per acre.		
	tons	cwt.	qrs.
Yellow Dent Maize	13	3	0
Early Leaming ,, ...	14	17	2
Sibley ,, ...	9	7	2
Hickory King ,, ...	14	2	0
Cocke's Prolific ,, ...	13	8	0
Sorghum saccharatum	9	10	0
Early Amber Cane Sorghum	23	11	0
Planter's Friend ,, ...	Failed.		

It will be seen by the foregoing results that Early Amber Cane yielded 9 tons per acre more than the most prolific of the maize varieties, and 14 tons per acre more than *Sorghum saccharatum*. An additional advantage which Early Amber Cane possesses over maize is that in a favourable season the former makes a second growth, frequently cutting several tons to the acre.

Planter's Friend appears to be too slow a grower for this district. The plants never reached a greater height than 2 feet 6 inches.

The experiment at Deniliquin was conducted on similar lines. Here again Early Amber Cane yielded 17 tons 14 cwt. per acre, whereas the best result from any of the maize varieties was only 8 tons 6 cwt. per acre.

The yields were as follow :—

Variety.	Yield per acre.			Variety.	Yield per acre.		
	tons	cwt.	qrs.		tons	cwt.	qrs.
Yellow Dent Maize ...	8	6	2	Early Amber Cane ...	17	14	2
Marlboro Prolific Maize...	7	2	0	*Sorghum saccharatum*...	12	1	0
Iowa Silver Mine Maize...	7	0	0	Planter's Friend ..	10	10	2

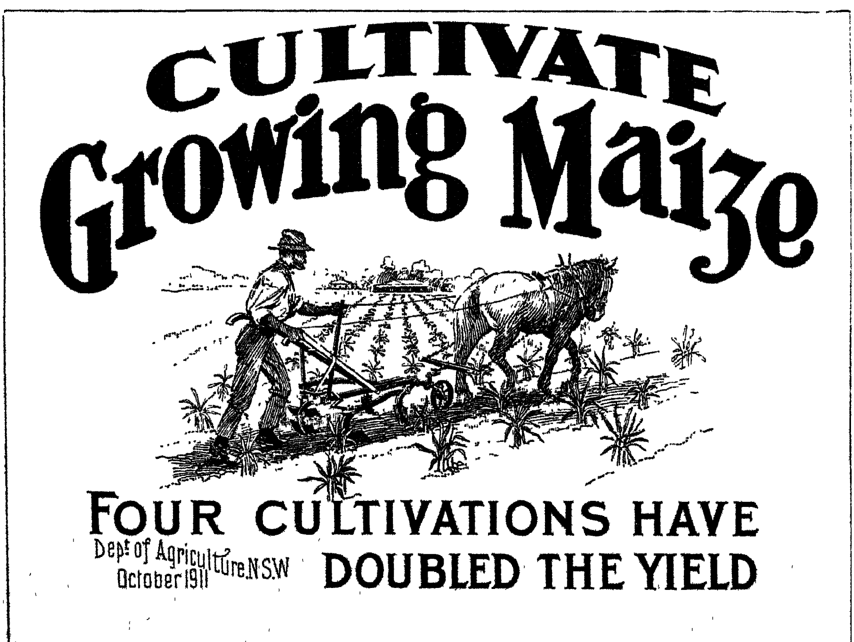
In both fields the addition of the artificial manure did not result in any material increase in yield.

Early Amber Cane *v.* Maize.

As mentioned above, the crop most commonly grown by dairy-farmers is maize, notwithstanding the experience that Early Amber Cane sorghum yields almost invariably a considerably greater bulk of green feed. The reason for this is usually found in the fact that maize can be fed to stock at any time of its growth, whereas Early Amber Cane should only be fed when the plant is well out in flower.

Deaths from poisoning are occasionally recorded through stock breaking into paddocks sown with Early Amber Cane or other sorghum ; still this danger is easily averted by secure subdivisional fences.

If it be found necessary to feed Early Amber Cane to stock before it has reached the flowering stage, many farmers adopt the practice of cutting the evening ration in the morning, and the morning's ration the evening before. By thus feeding the wilted stalks to cattle, the dangers attending the feeding of freshly-cut stalks are avoided.



Potato Experiment Plot, Mr. W. Moore's Farm, Guyra.

Variety: Early Rose. Manure: P4 (sulphate of ammonia, superphosphate, and sulphate of potash). Yield: 6 tons 3 cwt. 2 qrs. per acre; yield of unmanured plot, 4 tons 17 cwt. 2 qrs. Cost of manure: £1 11s. Value of increased yield due to manure: £7 3s. per acre.

Farmers' Experiment Plots.

Potato Experiments, 1910–11.

GEORGE VALDER, Superintendent, and Chief Inspector of Agriculture.

EXPERIMENTS were conducted in the chief potato-growing districts of the State with varieties of potatoes and manures for same. Trials were conducted on nineteen plots, three of which were situated in districts not usually considered suitable for potato culture.

The area of the sixteen main plots ranged from 1 to 5 acres, from $\frac{1}{10}$ to $\frac{1}{2}$ an acre being allowed for each variety.

The following were the average yields:—

Variety.	No. of Trials	Average Yield per acre.		
		tons	cwt.	qrs.
Freeman	4	6	8	3
Queen of the Valley	14	6	6	3
Satisfaction	12	6	4	3
Coronation	14	5	19	1
Early Manhattan	3	5	8	3
Up-to-date	10	5	7	1
Adirondack	14	5	6	1
Bliss' Triumph	13	5	3	0
Blue Derwent	4	5	1	0
Brownell's Beauty	12	4	12	3
Early Rose	10	4	10	2

The results from the three plots situated outside the potato districts are not included. Two of these, viz., at Grenfell and Dubbo, were failures, while at Gilgandra the yield was 2 tons 16 cwt. per acre without manure, and 3 tons 14 cwt. per acre from the plot manured with the P4 mixture. The variety grown was Satisfaction.

The results from the manurial trials were very consistent throughout, as only two centres did not record increased yields as the result of the application of manure.

The following are the average yields from the manurial experiments :—

Manure.	No. of Trials.	Yield per Acre.	Increase due to Manure.
		tons cwt. qrs.	tons cwt qrs.
No manure	14	3 19 1	.. ..
P1	14	5 8 1	1 9 0
P4	14	5 10 1	1 11 0

As only one manure was included in the trial at Gilgandra, the result from this plot has been omitted from the above table.

It will be seen that the application of manure resulted in an increased yield, sufficiently high to repay the cost of the manure, and also leave a substantial profit.

The manure mixtures used were as follow :—

P1 ... ... 8 cwt. dried blood.
8 cwt. superphosphate.
4 cwt. sulphate of potash.

Applied at the rate of 4 cwt. per acre, at a cost of 32s. per acre.

P4 ... ... 4 cwt. sulphate of ammonia.
13 cwt. superphosphate.
3 cwt. sulphate of potash.

Applied at the rate of 4 cwt. per acre, at a cost of 31s. per acre.

The whole of the plots in the variety trials were manured with the P1 mixture. The results from the manurial trials proved that the cheaper manure was more efficacious, and as a consequence the P4 mixture will be substituted for the P1 during the coming season's experiments.

These trials have furnished data which enable us to select varieties showing the greatest resistance to disease, and in this way have been of inestimable value. Those which were more seriously affected by blight are, with few exceptions, the only kinds grown by the majority of farmers at the present time. The results obtained should lead to the replacement of the older varieties by the newer and better ones, viz., Satisfaction, Coronation, and Queen of the Valley.

It will be noticed that the varieties just referred to have, with the addition of Freeman, given the highest average yields for the State. Although the latter variety gave the best average yield, it is not comparable with the other

varieties, as it was only included in four tests, which were conducted in centres not seriously affected by blight. Its resisting qualities cannot, therefore, be determined.

Two of the old and favourably known varieties, viz., Brownell's Beauty and Early Rose, were lowest in yield. This is due to their susceptibility to disease, and to the fact that available seed of both has materially deteriorated.

Taking the yields throughout, they are highly satisfactory, and show a considerable increase on the average yields for the State. This can only be ascribed to the facts that the seed was carefully selected, and that the plots received careful preparation and good subsequent cultivation.

POTATO EXPERIMENTS IN NORTH-WEST DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.

EXPERIMENTS were made during the past season at Tenterfield, Guyra, and Uralla, on the farms of Messrs. J. Chick, W. Moore, and S. C. Browning respectively. They included trials of different varieties and also of fertilisers. The yields altogether were satisfactory, and generally were superior to those obtained by surrounding farmers. This is chiefly due to the better quality of the seed selected by the Department, the excellence of the varieties, and the use of fertilisers. The high yields were partly due, however, to early sowing. The blight which attacked potatoes during the season was found in nearly all crops, but the severest damage was done to the late sown ones. The main effect was the destruction of the haulms, thus preventing further development of the tubers.

The blight was encouraged by the moist weather late in January and early in February. By that time the early crops had practically matured, whilst in the late ones the potatoes were only just formed. In a few cases the blight extended to the tubers, but in most cases it was confined to the haulms. Probably this was owing to the break in the weather, and the clear, sunny conditions which prevailed after the heavy rains of January and February. Had the weather continued wet, it is possible that the disease would have spread to the tubers more generally, and caused a greater loss than has been experienced.

Since weather conditions have such an important influence in encouraging blight, it is necessary in growing potatoes to study this aspect closely. The experiments this year showed by deduction that early sowing is best, as the crops matured before blight appeared seriously. Since in New England the heavy rains can be expected towards the end of January or later, the sowings should be made so that maturity will have been reached at or about this time.

The returns are given in the table attached.

VARIETY TRIALS with Potatoes, Northern Division, 1910–11.

	Coronation.	Queen of the Valley.	Satisfaction.	Adirondack.	Up-to-date.	Bliss' Triumph.	Brownell's Beauty.	Early Manhattan.	Early Rose.
	t. c. q.	t. c. q.	t. c. q.	t c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Tenterfield	7 10 3	7 11 3	5 10 2	4 18 1	......	4 7 2	5 10 0	7 3 3	6 15 0
Uralla	3 16 2	4 14 1	3 13 2	3 7 0	5 0 0	3 0 2	2 17 0	......	2 3 2
Guyra	7 10 0	5 17 2	7 13 2	7 8 3	1 6 3	5 8 2	3 17 2	......	5 18 1
Average...	6 5 3	6 1 1	5 12 2	5 4 3	......	4 5 2	4 1 2	......	4 18 4

NOTE.—The poor yield at Guyra from Up-to-date was due to very faulty germination. At Uralla, where the germination was good, it gave the highest yield. Owing to the poor germination it is not included in the averages. Early Manhattan was only tried in one district, and there it was beaten by two others. As its inclusion would give it too high a position it is also left out of the averages. Its merit can only be measured by comparison with other plots in the Tenterfield experiment.

Fertilisers.

Two kinds of fertilisers were used. It will be seen from the results that the fertilisers exerted an extremely beneficial effect in every experiment. Unfortunately, at Uralla the potatoes did not sprout satisfactorily in the plots where the fertilisers were used. This was not in any way due to the manure, but to loss of moisture prior to planting, as the seed had to be held for some little time after it was cut.

The following table shows the increases due to the fertilisers :—

	Tenterfield.		Guyra.		Uralla.	
	Yield per acre.	Increase per acre due to Manure.	Yield per acre.	Increase per acre due to Manure.	Yield per acre.	Increase per acre due to Manure.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
No manure ...	3 9 2	....	4 17 2	....	1 16 1	....
P1 manure ...	6 15 0	3 5 2	5 18 1	1 0 3	2 3 2	0 7 1
P4 manure ...	7 5 3	3 16 1	6 3 2	1 6 0	2 15 1	0 19 0

It will be noticed that in every case the highest yield was obtained from the plot treated with P 4 fertiliser. Since this contained a higher proportion of superphosphate, the difference is probably due principally to that ingredient.

Profit Resulting from the Use of Fertiliser.

Tenterfield.

Manure.	Increased Yield.	Value of Increase.	Cost of Fertiliser.	Profit.
	tons cwt. qrs.	£ s. d.	£ s. d.	£ s. d.
P1	3 5 2	22 18 6	1 12 0	21 6 6
P4	3 16 1	26 13 9	1 11 0	25 2 9

These potatoes were disposed of at £7 per ton on the trucks at Tenterfield.

Guyra.

Manure.	Increased Yield.	Value of Increase.	Cost of Fertiliser.	Profit.
	tons cwt. qrs.	£ s. d.	£ s. d.	£ s. d.
P1	1 0 3	5 14 0	1 12 0	4 2 0
P4	1 6 0	7 3 0	1 11 0	5 12 0

These potatoes were saved for seed, but when raised they were saleable at £5 10s. per ton on trucks at Guyra.

Uralla.

Manure.	Increased Yield.	Value of Increase.	Cost of Fertiliser.	Profit.
	tons cwt. qrs.	£ s. d.	£ s. d.	£ s. d.
P1	0 7 1	2 3 6	1 12 0	0 11 6
P4	0 19 0	5 14 0	1 11 0	4 3 0

The market value of these potatoes at time of digging was £6 per ton

Treatment of Seed with Formalin.

The seed before planting was treated by soaking in the formalin solution as recommended by the Department. This was done as a precautionary measure against scab and diseases generally.

It was repeatedly noticed that farmers' potatoes adjacent to the experiment plots, grown from untreated seed, were badly affected by scab, while those in the experiment plots were free. During the digging, tubers affected by scab were rarely seen, and those on which it was found were only affected in a minor degree. Mr. Browning, of Uralla, for instance, reported that "Local Brownell's . . . were more affected than the rest by scab; this seed was not dipped in formalin." At Guyra and Tenterfield the farmers who conducted the experiments also observed that untreated seed was damaged by scab, whilst the crops from dipped seed were unaffected. They announce their intention of treating all seed potatoes with formalin during the coming season.

The Varieties.

In order of maturity, the varieties may be placed as follows:—

Early Rose and Bliss' Triumph;
Satisfaction and Adirondack;
Brownell's Beauty and Up-to-date;
Early Manhattan;
Queen of the Valley;
Coronation.

Coronation is a very late potato. It gave the highest yield, and was apparently least susceptible to blight. Very few small or bad potatoes are produced. It is very large, somewhat uneven in shape, the skin dark, blotched with white, with blue eyes.

Queen of the Valley is almost as late as Coronation. It also appears to be resistant to the attack of blight. The potatoes are a good average size—no very large ones are formed. The skin is netted and pinkish. The eyes are deep and numerous.

Satisfaction.—The tubers are roundish and attractive in shape. Very few small tubers form, but occasionally the large potatoes are found to be badly cracked.

Bliss' Triumph is similar in appearance to Satisfaction, but is slightly smaller. It is also about a week earlier.

Brownell's Beauty.—This variety has not been found at all satisfactory this season. It succumbed quickly to blight, and consequently gave almost the lowest yield.

Early Rose.—This is not a suitable potato for New England. It is apparently only valuable where an early potato is required. It does not yield well enough, and does not keep satisfactorily.

Early Manhattan.—At Tenterfield, the only district in which this variety was tried, it gave a very satisfactory return. The potatoes are all fairly large. The skin is blue, and eyes numerous but not deep.

Up-to-date.—This is an exceptionally fine white potato. It is unfortunate that it sprouted so badly at Guyra. At Uralla it gave the highest yield. The tubers are of a very nice oval shape, very even, and attractive in appearance. They are almost all large, and very few small ones are found.

POTATO EXPERIMENTS IN SOUTHERN DISTRICT.

H. ROSS, Inspector of Agriculture.

THE potato experiments conducted in various parts of the Southern District during 1910-1911 were, in the main, a continuation of those of 1909-1910. They comprised trials of eight varieties of potatoes, in addition to manure trials; the experiment areas ranging from 1 to 5 acres.

The names of the farmers upon whose properties the experiments were conducted, and the respective localities, are as follow:—

Mr. John Eisenhauer, Rosewood, Tumbarumba.
,, O. E. Silk, Nimitybelle.
Messrs. Garraway and Allen, Tarago.
,, McMicking & Co., "Manus," Tumbarumba.

Preparation of Land and Planting.

The land, in all cases, was ploughed to a depth of 8 to 9 inches. The potatoes, which were cut, were ploughed in to a depth of 4½ inches, in rows 2 feet 6 inches apart, the sets being planted in the rows 1 foot 6 inches apart. Planting commenced late in October at Nimitybelle and Tarago; middle of October at "Manus," Tumbarumba; and middle of December at "Rosewood," Tumbarumba.

The quantity of seed used was 10 cwt. per acre. Previous to planting, the uncut seed was dipped for two hours in a formalin solution (8 oz. of formalin to 15 gallons of water), to guard against the dangers of scab. That this precaution is a wise one, and pays the farmer well for the extra trouble, is evidenced by the fact that in most cases the farmers' own crops, grown from untreated seed, showed considerably more signs of scab than the crops from the experiment plots.

Manuring.

In the variety trials the fertiliser, applied at the rate of 4 cwt. per acre, and at a cost of 32s. per acre, consisted of a complete manure—that is to say, a manure containing the three essential plant-foods, nitrogen, phosphoric acid, and potash. The nitrogen was supplied in the shape of blood manure, the phosphoric acid in the shape of superphosphate, and the potash took the form of sulphate of potash.

The manure was spread by hand against the bank of the furrow in which the potatoes were planted.

The yields are given in the following table:—

VARIETY TRIALS with Potatoes, Southern District, 1910–11.

Variety.	Nimitybelle.	Rosewood.	Tarago.	"Manus," Tumbarumba.	Average Yield.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q. lb.
Satisfaction	9 5 2	8 5 3	4 12 1	1 11 1	5 18 2 21
Queen of the Valley ...	7 4 1	8 1 0	4 14 2	2 18 1	5 14 2 0
Adirondack	7 18 0	7 3 2	4 10 3	2 15 1	5 11 3 14
Coronation	8 11 3	8 8 2	2 5 2	1 15 1	5 5 1 0
Brownell's Beauty ...	7 11 1	6 7 3	1 18 0	4 0 0	4 19 1 0
Early Rose	8 5 0	8 4 2	1 0 0	2 2 1	4 17 3 21
Bliss' Triumph ...	9 5 2	5 2 2	3 16 3	1 6 3	4 17 3 14
Up-to-date	7 18 0	6 5 1	1 9 2	3 17 3	4 17 2 14

Yields.

The tubers right throughout were of excellent quality. Satisfaction and Coronation were worthy of special mention, nearly the whole crops of these varieties being marketable.

Blight made its appearance in all the plots, but very late in the season. The tubers had then fully formed, so that the yield was not affected.

The low yields at Tarago and "Manus," Tumbarumba, are due to excess of moisture.

Manure Tests.

The most striking example of the benefits accruing from the use of manures was at "Rosewood," Tumbarumba. The unmanured plot of Bliss' Triumph yielded 2½ tons per acre, whereas the two manured plots yielded 7 tons 15 cwt. 2 qrs. and 5 tons 2 cwt. 2 qrs. respectively. This piece of land, it may be mentioned, had been cropped successively with potatoes, turnips, and summer fodders for a large number of years, which explains the large increase in the yield of potatoes on manured land.

The rich soil at Nimitybelle, being evidently plentifully supplied with the necessary plant-foods, did not respond to any appreciable extent to the application of artificial manure.

At both "Manus," Tumbarumba, and Tarago, the plots were situated on virgin land; no previous crop had exhausted from the soil any of the essential elements of plant-food. Therefore, the addition of more plant-food in the shape of artificial manure did not materially increase the yield.

Conclusion.

Wherever these plots have been established they have not only been a source of gratification to the farmer on whose land the plot is situated, but also to most farmers in the district; they have been an object lesson as to the right kind and quantity of manure to use; but, above all, they have been the means of introducing into various districts better quality and better yielding varieties of potatoes than those under cultivation hitherto.

POTATO EXPERIMENTS ON THE SOUTH COAST.

R. N. MAKIN, Inspector of Agriculture.

It was fortunate indeed that the Department did not attempt much in the way of potato plots on the South Coast during the past season. The heavy rain in January practically destroyed all potato crops which were growing at that time.

Two complete plots were sown, one at Unanderra and the other at Kangaroo Valley. A manurial trial was conducted at Bombala.

The Unanderra plot was practically totally submerged by flood-waters, and the results obtained were from a little strip of land running across the plot where the water did not remain for any time. This plot in the early stages gave great promise of a heavy yield.

The Kangaroo Valley plot also suffered considerably during the wet period, but not to the same extent as at Unanderra. We were compelled to calculate our yields from a sandy portion of this plot, which contained the soundest tubers; but under more favourable weather conditions the better class of soil would have given a much higher return, judging by individual good roots and the appearance of the potatoes that had rotted.

No appearance of Irish Blight was detected on the Kangaroo Valley or Unanderra plots.

The Bombala plot, sown in November, gave great promise until the flowering period. Unfortunately the crop was then attacked by Irish Blight, with the result that the yields were considerably reduced.

The results from the South Coast plots were as follow:—

VARIETY TRIAL.

Varieties.	Unanderra			Kangaroo Valley.			No. of Trials.	Average Yield per acre.		
	Yield per acre.			Yield per acre.						
	tons	cwt.	qrs.	tons	cwt.	qrs.		tons	cwt.	qrs.
Adirondack...	4	5	2	6	2	0	2	5	3	3
Bliss' Triumph	5	2	3	9	14	1	2	7	8	2
Coronation	5	14	1	5	14	1	2	5	14	1
Early Rose	....			2	17	0	1	2	17	0
Queen of the Valley ...	5	14	1	7	11	1	2	6	12	3
Satisfaction...	6	17	0	8	9	1	2	7	13	0
Up-to-date	....			6	0	0	1	6	0	0

MANURIAL TRIAL.

Manure.	Unanderra.			Kangaroo Valley.			Bombala.			No. of Trials.	Average Yield.		
	Yield per acre.			Yield per acre.			Yield per acre.						
	t.	c.	q.	t.	c.	q.	t.	c.	q.		t.	c.	q.
No manure	2	17	0	6	2	0	5	2	3	3	4	13	3
P1	5	2	3	9	14	1	7	2	0	3	7	6	1
P4	4	11	1	8	0	0	7	0	2	3	6	10	2

In every case the formalin treatment seemed to have a marked effect. Plants from treated seed appeared more vigorous than those in adjoining untreated plots. Many farmers have noted this, and, I have no doubt, will practice the treatment in the coming season.

THE CASTOR OIL PLANT (*Ricinus communis*) AS A FODDER.

ON the Macquarie Flats, in the Dubbo district, this plant was the predominant vegetation in 1876. After the first frost the plant begins to die, and it was then that Mr. W. Baird turned 1,100 wethers into about 90 acres. At first the sheep would not touch the castor oil plants, but ultimately they fattened on them. The mutton was slightly tainted by the feed, but the flesh was of good colour.

Three years ago Mr. Baird did likewise, on the same piece of land. The prickles on the pods of the plant become very soft after they have been frosted, and the seeds were what the sheep particularly relished; but they also ate the wilted leaves.—MARK H. REYNOLDS, Inspector of Agriculture.

Maize at Grafton Experiment Farm

A. H. HAYWOOD, Manager.

As the pioneering work on this Farm is not yet completed, many of the cultural details have not reached the stage at which we shall be practising what we would recommend for fully developed farms in the Clarence district. In describing the work with maize it is desired that the reader should bear this in mind. The implements and the operations which should find place upon good clean land are sometimes out of the question when the soil still contains hidden stumps and roots left from the clearing.

Very little maize is grown for forage in the Clarence district. Maize would provide feed in the summer months, but the rains which fall at that season usually ensure ample feed for stock. We often meet with a dry spring, but the season of the year when feed is really scarce is the winter. That requirement is not met by maize as a forage crop.

Maize is grown almost exclusively for grain, and generally in fairly small areas. The tendency to aim at getting in as large a crop as possible is not so evident in this district, where maize and potato lands have already reached a considerable price.

On the commercial maize area of this Farm, 112 acres were planted last year, and the total yield has exceeded 7,000 bushels. At the time of writing the whole of the crop has not been harvested. Whilst we have obtained small crops which greatly exceeded this in average (reaching 112 bushels per acre this year), the figures will indicate the yields which farmers may fairly expect to receive from land similar to ours, if they should adopt the methods described below. The profit which such a crop would give would depend upon the cost to the farmer. We can give a few items of cost which are not generally known, but it is impossible for us to estimate accurately the farmer's costs ; he can do it much better himself.

Preparation of the Land.

It is an undoubted advantage to plough maize land a few months before sowing time, and to give the land a short bare fallow. The best rotation of crops for the district has not yet been worked out; but it would be idle to assert that these rich alluvial soils will suffer by growing maize continuously for a few years after clearing. Still, it must not be assumed from this that we agree with the too common practice of growing maize year after year on the same ground. What we can and do practice for the first few years after clearing would be a great mistake on older maize lands, which tend to become full of disease, and upon which the weeds which miss the cultivation for maize, gain the upper hand, and can only be suppressed by a change of crop.

Our aim is to get the previous crop off the land as quickly as possible, and plough the ground up roughly. For this main ploughing, the mouldboard type of plough is preferred. Of course, it is impossible to lay down a rule which will apply in all cases, but upon both the rich alluvial soils and

the higher volcanic red land, we prefer the mould-board plough to the disc. Sometimes we do use the disc in the first ploughing, as it gets over the ground more quickly than the single-furrow mould-board, but if time permits we always use the mould-board.

The bulk of our maize land has hitherto been ploughed with a single-furrow plough. We have not used multiple-furrow ploughs, for the simple reason that our land still contains many roots and stumps, which can only be found with the plough, and in such land ploughing with set ploughs is impossible. When the paddocks are in good order we propose to use four-furrow mould-board ploughs, and we hope by such means to cheapen the cost of production very much. Still, the single-furrow implement turns over an acre a day, and does the work well. The cost does not exceed 10s. per acre.

Yellow Dent Maize, in Stud Plots—Grafton Experiment Farm.

The land is left in this rough condition until it is time to prepare for sowing, when it becomes necessary to obtain suitable tilth. On the alluvial soil we aim at getting a fine tilth, but we prefer to leave the volcanic soil a little more lumpy, as it is of a binding nature.

In both cases the first operation is to cross-plough. This is done with the disc plough. Subsequent treatment depends upon the condition of the soil. As will be explained below, the stalks from last year's crop are chopped up before the first ploughing; but even these chopped pieces will fail to rot unless the soil is compacted with the roller. When we follow maize with maize, therefore, we use the roller after cross-ploughing. But on the volcanic land we are very careful about rolling. If the soil be fine enough already we prefer not to roll; but where maize follows maize and the stalks are ploughed in, rolling is compulsory. If maize follows potatoes on volcanic soil, we should not recommend the use of the roller; and even on alluvial ground, under such a system of cropping, a farmer would do well to consider whether he cannot get the soil fine enough without rolling it. But in a dry time disc harrows will not break up the clods, whilst the roller will pulverise them.

Wherever the land is rolled, it is always harrowed afterwards. The effect of compacting the surface by rolling is to draw moisture to the surface from below. If the land be left in that condition, this moisture will evaporate. Harrowing breaks the surface and forms a mulch, which checks the evaporation, whilst it leaves the sub-surface, where the chopped-up corn-stalks have been placed by the plough, in a compact, moist state which will hasten their decay. To roll land and not harrow it would be a very bad practice in this district. The spring is generally dry, and the land would dry out so quickly that one would be surprised to see the crop come up well. The rolled surface is broken with tine harrows.

Where the roller has not been used, we disc-harrow if we do not consider the tilth fine enough. In some seasons the soil is in such a condition that the ploughing and cross-ploughing leave it quite fine enough. In such a case we do not use the discs, but simply use the tine harrows. In any case, we must harrow with tines, even after the disc, to even up the surface for sowing.

Sowing.

A one-row "Farmer's Friend" corn planter is used for sowing. Formerly, it was necessary during dry spells to open the furrow with a plough before sowing, but we had a furrow opener fitted to the front of the drill. It is in the form of a double mould-board fitted in the wheel standard, and does the work excellently. The furrower is particularly necessary in a dry time, as it enables the seed to be placed in the moist soil beneath the surface and throws out any clods. This deep sowing has another advantage—it enables us to harrow after sowing and kill the weeds as they come, besides maintaining the loose mulch and conserving moisture for the critical period—the dry spring.

The plates and sprocket-wheels which govern the distance of planting and number of kernels to the hill are here described for our two main varieties:—

For *Early Leaming*, use an 8-hole plate with ½-inch holes and 13-sprocket wheel. This drops two and sometimes three kernels every 24 inches.

For *Yellow Dent*, use a CD 85, 5-hole plate, ⅝ inch thick (as supplied with "Farmer's Friend" planter), and a 9-sprocket wheel. This will drop two kernels every 28 inches.

The American system of planting a single kernel every 15 inches, after many trials here, has been discarded in favour of the above. There is a greater tendency for maize to "sucker" when planted one kernel to the hill, especially in early varieties, and the yield per acre is less.

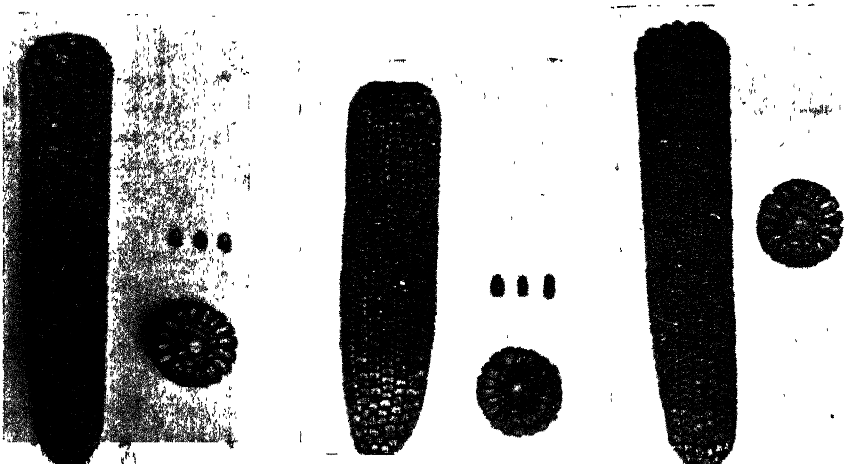
There is generally some maize sown by the end of July. Early maize is sown from the end of July and right through August. Early varieties are also sown in September and October, to provide seed for next year's crop. Weevils infest crops sown in July and August, whilst October-sown maize is generally pretty free from the pest, and is the best for seed. Late varieties are sown from October to December. The drills are 4 feet apart for the early varieties and 4 feet 6 inches for the late ones.

Subsequent Cultivation.

After sowing we harrow to kill the weeds, using light tine harrows and just raking up the surface. The harrows are run in the direction of the drills. When the maize is a few inches high we harrow again, but we always wait for the middle of a warm day. In the early morning young corn is brittle and snaps off under the harrows. At midday it is tougher and stands the treatment without injury.

After this harrowing, the scarifier or scuffler is run between the rows to kill the weeds. This is done when the corn is about 6 or 8 inches high, and a later scarifying is usually necessary as well. Generally, two suffice.

When the maize is about 2 feet 6 inches high, it is hilled. This is done with the single-furrow mould-board plough, throwing a furrow up from each side. The middle is then taken out with the same plough. Some use the disc hiller, which straddles the row and takes each side as far as the centre of the space between rows. I am of opinion that the use of this implement involves more danger of cutting surface roots than the mould-board plough; but in any case we could not use it on Grafton Farm, as the ground is not yet completely cleared.



Funk's Yellow Dent.

The advantage of hilling is that it smothers the weeds between the plants. It also helps to support the stalks against winds, but there is no other practicable method of destroying the weeds which grow between the maize stalks. Of course, we sacrifice more moisture than is lost by flat cultivation, but in the Clarence district it pays to hill maize. We have dry springs, but we have rains after Christmas. I only claim advantages for hilling so far as the Clarence district is concerned. In other localities it may not be profitable.

Hilling is the last cultivation. When the crop reaches a height of about 4 feet it is impossible to cultivate, because the stalks overlap in the rows, and

a horse cannot be used. Hand cultivation is out of the question in practical maize-growing. During last season, on account of the heavy rains in January and February, the weed known as "Stinking Rodger," grew in some of our maize paddocks to a height of 10 feet. These weeds sprang up after the last cultivation, and it was impossible to suppress them. When land becomes heavily infested with this pest, the only remedy within my knowledge is to grow another crop with a different growing season.

Harvesting.

The cobs are pulled by hand and thrown into a dray which follows through the crop. Six or eight rows are harvested at a time, and the harvesters work in front and at the sides of the dray. The dray knocks down two rows as it proceeds, but that does not matter, as those rows have already been harvested in advance.

Pulling costs us 7s. 6d. per acre, and carting 1s. per acre, in a 50-bushel crop. The local contract price for pulling, carting, husking, threshing, and bagging is about £1 per acre—that is, when horse-works are used.

There is large room for invention of machinery for pulling corn. A cost of 7s. 6d. for pulling per acre is excessive, compared with the price at which other agricultural operations can be performed with modern machinery. This price has to be paid, no matter what system of husking and threshing is followed.

Wherever possible our maize is harvested whilst slightly on the under-ripe side.

It might be an advantage to take the harvester into the field, and move it perhaps four times in an area of 120 acres. That would save the bulk of the cartage to the thresher. But this would require a portable engine. There is no husking done in the field on the Clarence. To harvest in the field it would be necessary to harvest just when the crop is ripe for threshing, which would mean exposing the crop longer to risks of rain or floods.

Threshing.

The cobs are carted up and put into cribs to dry in the husk. They may be left there without injury for months, so that we can wait until labour is available for threshing or the market suits. The machine with which the threshing is done is the Acme Husker and Sheller, described in the *Gazette* for November, 1910. The machine cleans and bags the grain, and it is only necessary to sew the bags. The opinion of the Acme machine, expressed in the article referred to, has been fully borne out by experience since that date.

From our bulk crops, seed is selected for sale to farmers. About £500 worth is transferred to other Government institutions, whilst about 1,000 bushels are fed to pigs on the Farm, and 500 or 600 bushels to the Farm horses. The surplus is sold to the best advantage, either locally or on the Sydney market.

Varieties.

This question is of such importance to the district that it merits a little extended discussion. Maize is a plant which is easily cross-fertilised, and it is difficult to keep the varieties pure while different varieties are grown in

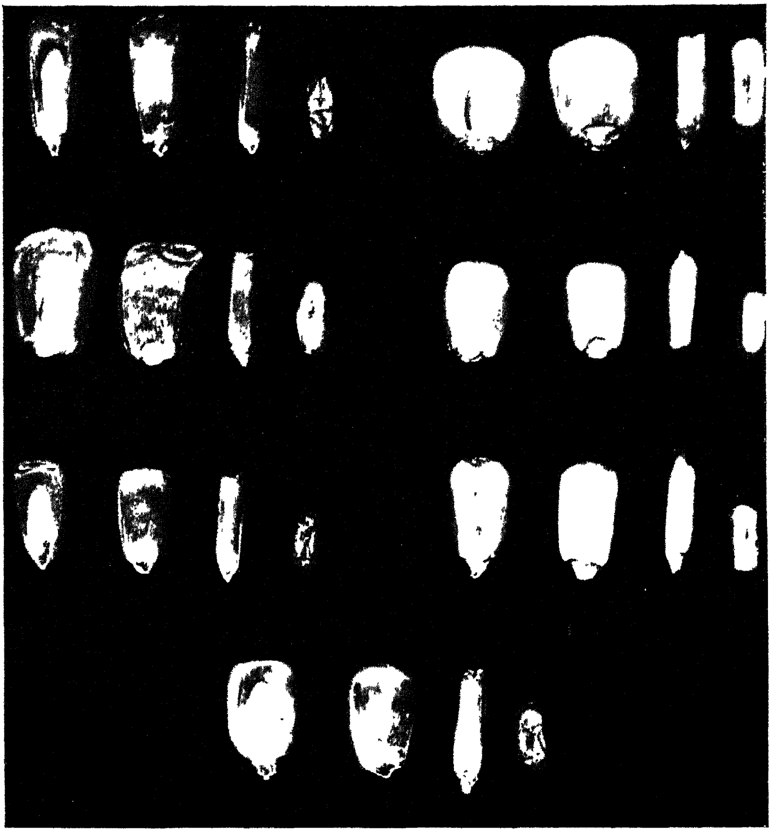
the same district, particularly those which flower about the same time. It would be a most decided advance if all the farmers of this district would agree to grow only two varieties of maize—one early and one late. The two most suitable varieties should be chosen, and improved by selection of seed.

For the Clarence River district I have no hesitation in recommending that the two varieties to be grown be Early Leaming and Yellow Dent. These two maizes yield well, and produce grain which seems to meet the requirements of the market. Every farmer is recommended to grow only these;

Boone County Special.

and if that is done there will be less danger of cross-fertilisation. Any farmer who cares to take the trouble can improve his seed by selection, whilst the work in the stud plots at this Farm, described below, will prevent inbreeding, thus ensuring that the Clarence River shall always have a healthy maize stock.

This last season we grew 40 acres of Early Leaming, and the balance of the area was mostly Yellow Dent. A little of Large and Small Horsetooth has been grown, but these will be dropped for the future. Of course, we must continue with variety trials in plots as experiment work, but precautions are always taken to prevent crossing with the Yellow Dent or Early



1 2

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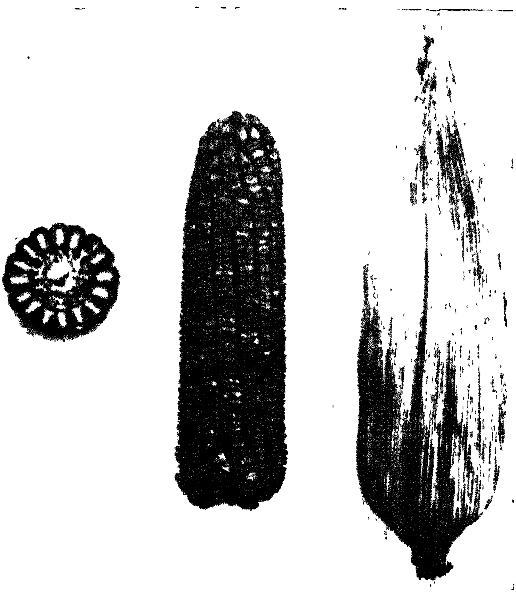
Varieties of Maize.

Four typical grains of each variety are shown, illustrating germ; kernel reversed; side view, and indentation. The varieties are—1. Small Horsetooth. 2. Hickory King; 3. Large Horsetooth; 4. Marlboro Prolific, 5. Early Leaming; 6. Boone County White; 7. Improved Yellow Dent.

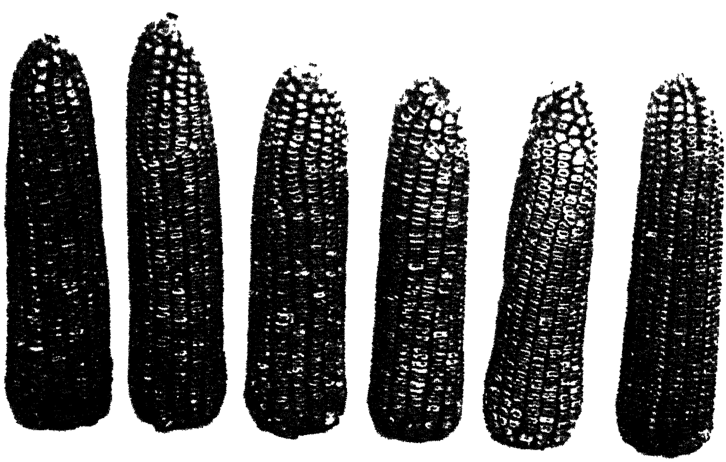
Improved Yellow Dent.

MAIZE AT GRAFTON EXPERIMENT FARM.



Yellow Dent.

Maize Ear, showing Silks.



Yellow Dent.

MAIZE AT GRAFTON EXPERIMENT FARM.

Leaming. If we succeeded in finding a variety superior to either of these, it would soon be grown in preference, and the River would soon change to it. This scheme may seem rather extravagant, and, perhaps, impracticable; but we should remember that in other parts of New South Wales one variety of wheat, Federation, is universally grown in areas much larger than the whole of the Clarence district.

The following notes upon these and other varieties are offered for the information of local farmers. They are based upon observations of the varieties as grown at this Farm :—

Improved Yellow Dent.—An acclimatised variety, which has been grown at this Farm for the past five years, and has given consistent yields every year. It is a hardy variety, and one outstanding feature is that it stands a lot of rain at harvest time. The husk surrounds and covers the cob completely, even when dead ripe, and thus protects the grain from damage by wet, which is a big factor in moist districts.

It is also an all-round variety, being suitable for fodder and grain, and has a wide adaptation. Good reports have been received from all parts of the State where it has been tried against other varieties.

The ears are medium, 9 to 10 inches in length and 8 inches in circumference. Number of rows, eighteen to twenty; kernels fairly deep and uniform. The grain is hard, and the indentation fairly smooth. Colour of kernels golden yellow, with light yellow crown. The grain has a high percentage of protein, as indicated by the large germ and horny substance as shown in the plate.

Early Leaming.—Of all early varieties tried here, none has come near this in yield. It is wonderfully adapted to different soils and climates, and extremely hardy. The ears are tapering, having sixteen to eighteen rows. Length of ear, 8 to 9 inches; circumference, 7 inches.

The colour of grain is dark yellow or red. The kernel is fairly deep, with medium indentation, and very heavy, and the cob well packed. The butts and tips are well filled, and the cob has a very compact appearance.

This variety has been grown at this Farm for the past four years, and has always been a consistent yielder. The maximum yield this year was 517 bushels from 5 acres. It stands a lot of wet weather, and the cob is well protected by husk. It also stands the effects of dry spells better than any other variety.

Large Horsetooth.—A late variety, with very deep grain and small percentage of cob. The grain is, however, soft, and will not stand too much wet when ripening. It is, under fair conditions, a heavy yielder of grain. The average length of cob is 10½ inches; circumference, 7½ inches; and number of rows, sixteen; indentation rough; butts and tips well filled; colour, light yellow. It is adapted to the rich alluvial river bank soils.

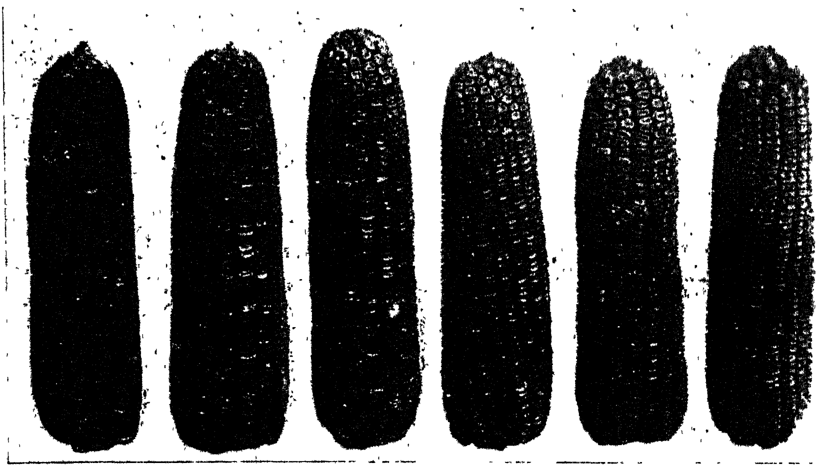
Small Horsetooth is very similar to Large Horsetooth, except that the grain is much smaller and the ear shorter, and it is a medium early variety.

Hickory King.—A variety grown largely for fodder. It is adapted to the poor classes of soils. Its chief characteristic is the very low percentage of

cob and large broad kernels, which are of a somewhat flinty nature. It is an early variety, but not a heavy yielder in grain per acre.

Boone County White.—An imported variety, in its third year of acclimatisation. It is a fine large ear, with eighteen to twenty-two rows, 10 inches long and 7½ inches in circumference. The colour is creamy white, and the indentation fairly rough. It is a heavy yielder, but a soft variety. It is early maturing, but not too well protected by the husk at the tip of ear, hence the ear is liable to moulds and inroads of insects. It is preferable to harvest a maize of this description a little on the green side.

Up to date, my opinion of its suitability to the North coastal conditions is not very favourable, on account of the weak points mentioned.



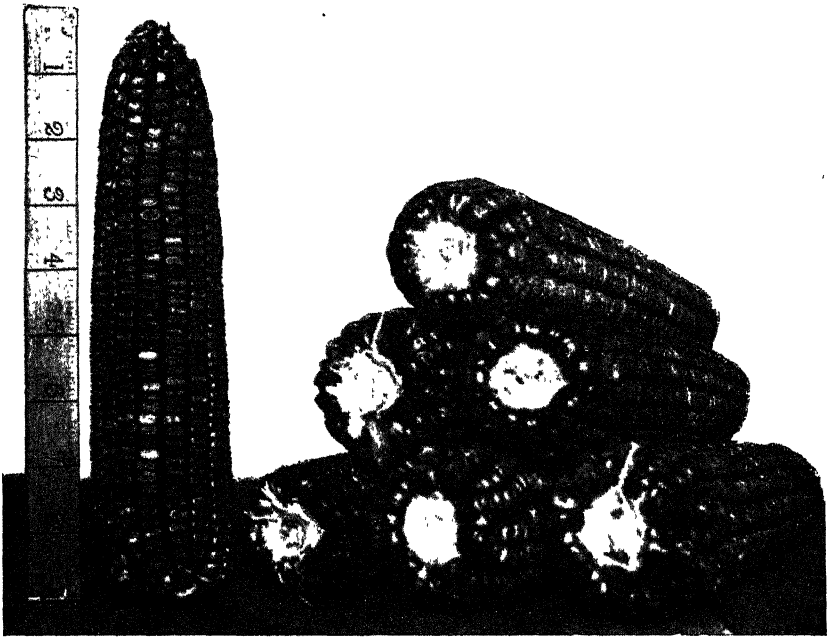
Large Horsetooth.

Funk's Yellow Dent.—A recent importation, now in its third year, is about a fortnight earlier than Early Leaming. The ears are 9 to 10 inches long and 7 inches in diameter. The indentation is medium smooth, and the colour light yellow with a light cap. The grains are not deep, and the percentage of cob rather high. The butts and tip are well filled. This variety does not promise to excel some of our acclimatised varieties.

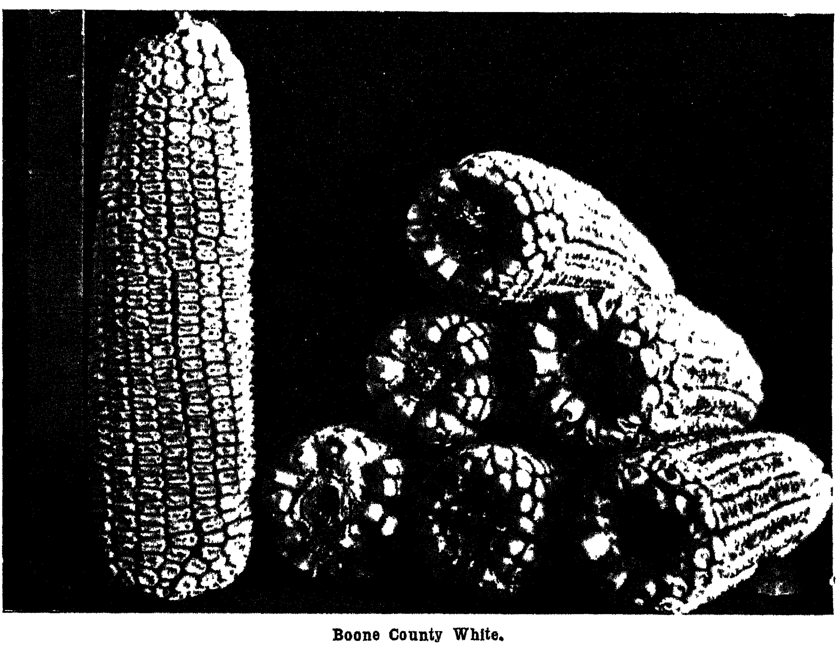
Marlboro Prolific is another of the imported varieties. The ears are very small, but two or more ears are commonly produced on each stalk. It is hardier than Boone County, but not so soft; in fact, it is more of a flinty nature. There is very slight indentation, and the grain is not deep. It is more adapted for fodder purposes.

The Chopping Roller.

The attention of farmers in other parts of the State is drawn to the value of this implement, which is now in general use on the Clarence. At this Farm its merits have been amply demonstrated. It is made by local blacksmiths, and is in the form of a heavy roller, with knives running lengthwise, and set about 6 inches apart. A wooden guard over the top avoids danger of accident to the driver. It is drawn by two horses, and rolls down the maize



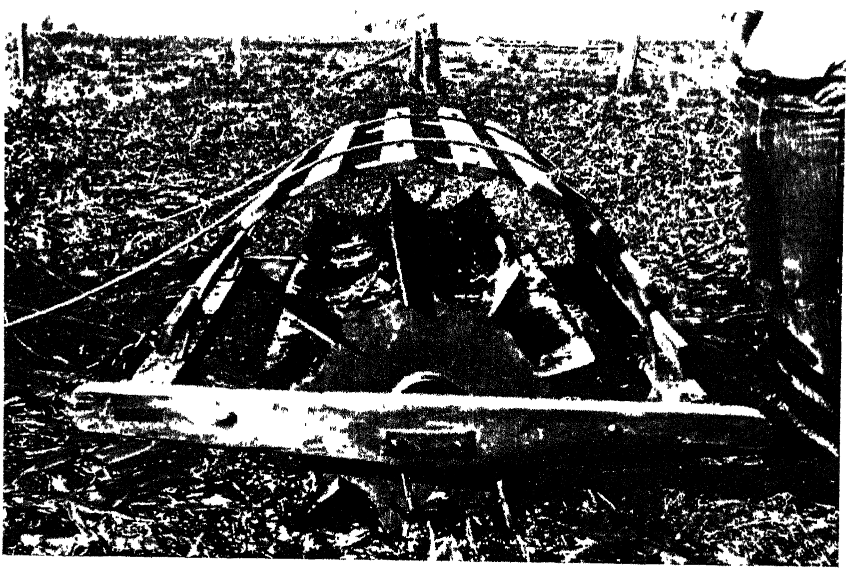
Early Leaming.



Boone County White.

MAIZE AT GRAFTON EXPERIMENT FARM.

The Chopping Roller at work.



The Chopping Roller, showing construction.

MAIZE AT GRAFTON EXPERIMENT FARM.

stalks, chopping them into lengths of 6 inches, and thus enabling them to be easily ploughed in. It is also used for destroying many of the long weeds which are so prevalent on the River. Taken all round, we regard it as one of the most valuable implements on the Farm.

Grazing Maize with Cattle.

Many dairy farmers in this district depend upon cornstalk paddocks for their winter feed. I have no hesitation in saying that this is a huge mistake. Ploughing is postponed until spring, by which time the ground is as hard as a floor from the tramping of the cattle. Sometimes the mechanical condition of the soil is ruined for years. Whatever may ultimately prove the true solution of the winter feed problem, it will certainly not be that. In dry weather, it is quite reasonable to graze cattle on the cornstalks for a few days, and we sometimes do this before using the chopping roller, but we remove them before any serious damage is done to the soil.

The Stud Plots.

A brief account of the work in the stud maize plots at the Farm may prove a fitting conclusion to these notes. The best cobs are first selected for seed, and the kernels are picked from the centre of the cob, not from towards either end. It is not definitely established that the centre gives better seed, but it is certainly more uniform and easier to plant. We also consider how the cob is placed on the stalk, select those with medium length of shank, and generally choose cobs which as nearly as possible represent perfect grain on perfect stalks. Barren stalks are cut out before they shed pollen. These selected grains are grown by the inter-row system, aiming at the prevention of inbreeding and at the same time preserving the purity of the variety.

The first row contains all grain from the same cob, whilst the second is all from another cob of the same variety, and so on. As soon as the tassels appear they are pulled off by hand from every plant in every second row. The barren stalks in the other rows are also detasselled at the same time. The row which is detasselled thus carries all female flowers, which must be fertilised by pollen from the adjacent rows. The cobs formed on these female rows are the stud seed. The other rows may be self-fertilised, so the produce is used for horse-feed or in other ways.

The stud seed thus produced is used for planting our commercial maize paddocks, and the best produce from these again is selected for sale to farmers as seed. It would be impossible to raise any considerable quantity of seed from the stud plots direct; in fact, it is only now that we are able to raise sufficient to sow our own paddocks. This will, however, be the invariable practice for the future, so that farmers buying seed-maize from this Farm will be sure of getting seed which cannot be inbred for more than one generation. This should help to enhance Clarence River maize; indeed, if farmers will co-operate with us in the several ways indicated in this paper, the Department and the farmers together should be able to ensure that Clarence River maize will have a future even more glorious than its past.

Trials of Imported Lucerne Seed.

THE Department of Agriculture recently obtained samples of different kinds of lucerne seed from the United States, and trials have been made at the Experiment Farms and elsewhere to ascertain whether any of them have greater value in any respect under our conditions than the strains at present in cultivation. Preliminary reports are now available from a number of farms, and are published in this issue; but before coming on to them, a brief account of the history of lucerne in general, and of these varieties in particular, may enable the reader to obtain a better grasp of the purpose of these trials, and the likelihood of profitable results.

All lucernes belong to the natural order *Leguminosæ*, or the "legumes," which include clovers, peas, beans, and other plants which bear their seeds in pods. The legumes embrace such vastly different plants as the Darling Pea, the Black Bean, the Carab Tree, and the Wattles.

The genus, or subdivision, of leguminous plants, which includes the lucernes, is known to botanists as *Medicago*, or the "medicks." Some fifty species of *Medicago* have been identified, but only a few are of any practical value as fodders; and the most valuable of all, the one which includes the ordinary lucerne of cultivation, is *Medicago sativa*, Linn.

This plant has been known as "the best fodder" as long as the history of the human race can be traced. Its native home was apparently in Asia, where we find the earliest records of man. When it began to be cultivated it is impossible to say now. The Chinese cultivated it from very early times, and the Romans brought it from Media about 470 B.C.—hence the name *Medicago*. Since those ancient times it has been carried all over the civilised world, whilst very few of the other "medicks" have been deemed worthy of cultivation, though some of them form excellent grazing plants in their wild state.

When a plant is grown for a long period in one locality it acquires certain very definite characteristics, which become permanent. Lucerne affords an excellent example of this influence of locality on plant life, for lucernes grown in different parts of the world may be so vastly different that when placed together one would express some surprise on being told that they are the same plant. They differ in habit of growth, form, size, and colour of leaves, proportion of leaf to stem, and colour of flowers; and they also differ in resistance to drought, heat, or cold, vigour of growth, seed production, &c. The consequence is that, although most of the cultivated lucernes are botanically identical, their characters as cultivated fodder-plants vary in a marked degree. Even in this State differences are slowly being evolved between the lucernes of different localities.

The practical significance of this is that we may hope, by testing foreign strains of lucerne, to obtain varieties which may be of more value for particular purposes than the one now in cultivation here. If so, and the particular variety is acclimatised, we may hope to extend the area of the

State which is suitable for lucerne and increase the productiveness of some of the lands now devoted to that plant. Cross-breeding and selection of plants should at once open up a profitable field of research, which may afford great and lasting benefit to the State. Those who may be inclined to regard this assertion as visionary are reminded that Mr. Farrer produced Federation wheat by cross-breeding a Manitoba and an Indian wheat with the Purple Straw then extensively grown in Australia.

In the United States, lucerne (there called "Alfalfa") is grown very largely, particularly in the Central and Western States, and the official and private reports upon it are most enthusiastic. But the United States is a great and wealthy country, with an immense population, and its Government cannot afford to neglect any opportunity of improving the food-yielding capacity of its soil. The United States Department of Agriculture have sent agricultural explorers to scour the world for seeds of new crops and new varieties, which may be of value to American farmers. Amongst these explorers may be mentioned Professor N. E. Hansen, of the South Dakota State College of Agriculture, who, during the past twelve years, made three trips to the colder regions of Europe and Asia, on behalf of the Federal Department, in search of new lucernes and other forage crops.

By this and other means the United States Department has obtained seed of a large number of varieties of lucerne and other species of *Medicago*, and is trying them in comparative field tests. That Department has not yet been able to give definite results to American farmers, as a variety of lucerne has to be acclimatised before it will give its best returns in a new home. But in July, 1909, the New South Wales Department asked the American authorities for samples of seed of any varieties which they could recommend as suitable for trial here. Mr. B. T. Galloway, Chief of the American Bureau of Plant Industry, courteously supplied us with about 4 lb. each of seed of the varieties Arabian, Peruvian, Montana, Turkestan, and Sand.

These parcels of seed were received in November, 1909. They were divided into quarter-pound packets, and sent to the Hawkesbury Agricultural College, Experiment Farms, and Inspectors of Agriculture for trial by farmers who would care to provide ground for the tests. In this way the varieties will be tested over a wide range of conditions.

In order to give an idea of the characteristics of these varieties in their native regions, the following notes have been extracted from Bulletin No. 155 of the Kansas State Agricultural College, from Bulletin No. 150 of the Bureau of Plant Industry, United States Department of Agriculture (Professor Hansen), and other sources :—

Arabian Lucerne is more upright than most varieties, and has more succulent stems, and larger, broader, and lighter-coloured leaves. It is said to be more productive and vigorous than American, but less able to withstand cold.

Peruvian is said to be a very promising sort for warm climates. It is very productive, and it is also claimed to be able to grow at lower temperatures, within its range, than any other variety known. It has,

therefore, a long growing season. But it has two disadvantages—hairiness and a tendency to become woody. These can be overcome by thick seeding; but in dry districts thin-seeding of lucerne is a necessity.

Peruvian lucerne has given far the best results of all those tried under irrigation at Yuma, Arizona. In the North-western States of America it is found to lack hardiness, and cannot stand the cold winters. Its low zero-point of growth keeps it growing when other lucernes are resting for the winter, which fact makes it susceptible to sudden freezes; but Yuma lies in latitude 32° N., has an elevation of 137 feet above sea-level, and the mean temperature ranges from 72° to 92° Fahr. These conditions are very similar to those of the far north-west of New South Wales.

Turkestan, coming from a country of long, dry, hot summers, is claimed to be very hardy and drought-resistant, and also to be able to stand extremes of heat and cold; but it is lower than the ordinary sorts and slightly more spreading, and the stems are smaller and somewhat wiry. The leaves are narrower, smaller, and slightly more hairy than those of American lucerne. Large quantities of seed are annually imported into South America, where this variety appears to be adapted to a large area.

Sand Lucerne.—This plant appears to be a natural hybrid between ordinary lucerne (*Medicago sativa*) and Yellow Lucerne, or Swedish Clover (*M. falcata*). It is known to botanists as *Medicago media*. Yellow Lucerne is a wild forage plant of Northern Siberia. It has attracted a great deal of attention as being probably suitable for the cold, dry regions of North-western America, but it would appear to be useless to attempt its cultivation in Australia.

Sand Lucerne, however, would seem to be worth attention. It is largely cultivated in Hungary. It is more spreading than ordinary lucerne, but is claimed to be hardier, more drought-resistant, and better able to stand grazing; and it is said to succeed on sandy soil too light for other forage plants. The flowers range from bluish purple to yellow lemon; the pods form only about three-fourths of a coil, and are lighter than those of true lucerne.

So much for the varieties in their native homes; how these characteristics will be maintained in New South Wales it is yet too early to say. When asked a similar question with regard to the lucernes and clovers which he brought from Siberia to the United States, Professor Hansen replied that he was not a prophet, nor the son of a prophet. But the following reports will show how the varieties are behaving now in various parts of the State. There are other plots which have only lately been sown, and from which we are not likely to obtain results for some time to come; but a later report will be published regarding these and a second year's growth of the plots already covered.

I.—COASTAL DISTRICTS.

Reports are available from Wollongbar and Grafton Experiment Farms, on the North Coast; from the Hawkesbury Agricultural College, Richmond; and from Mr. Jas. Chittick, of Kangaroo Valley, a farmer who kindly permitted the Department to establish plots upon his land.

A.—Wollongbar Experiment Farm.

ERNEST BARING, Experimentalist.

The lucernes under trial, five in number, were obtained from the United States of America, and with the exception of one variety, known as "Sand Lucerne," they bear the names of their original homes, viz., Montana, Turkestan, Peruvian, and Arabian. Australian-grown Hunter River seed was used as a check, for purposes of comparison.

The plots sown were uniform in size, each consisting of four drills of lucerne, 18 inches apart and 28 yards in length, with a space of 2 yards intervening between each two varieties. The soil was level and even in quality throughout. While being deficient in lime, it was otherwise fairly rich, and suitable for the growth of lucerne. It can be described briefly as an extremely red, friable clay, of basaltic origin, typical of much of the soil in the well-known "Big Scrub country" of the Richmond River.

The soil was carefully prepared before sowing, being ploughed and subsoiled deeply. It was then thoroughly harrowed, freeing it from all weeds and other rubbish, and bringing the surface to a fine state of tilth. No manure was applied at the time of sowing; but a dressing of lime at the rate of 10 cwt. per acre was given to each plot after the second cutting was removed.

Seed was sown on 22nd January, 1910, and germinated in a satisfactory manner. With the exception of the Hunter River and Arabian varieties, the growth of the lucernes was rather slow at first. The first cut was taken on the 30th May, just over four months from the time of sowing. All particulars of the subsequent cuttings will be found in the accompanying table.

After each cutting, the plots were hoed, to destroy any weeds which made their appearance during the growth of the crop. This work, namely, the destruction and eradication of weeds, represents the most serious problem before the lucerne-grower of this district. Hand-hoeing is costly, owing to the large amount of labour entailed, and so is not to be desired; while in this warm, moist district, the growth of weeds is so rapid and deep-rooting that it is difficult to cope with them by harrowing or other cultural methods.

Trouble was caused by two pests, namely, Dodder, and the Rose-leaf Beetle (*Monolepta rosea*). Early in November a small outbreak of dodder occurred in the Peruvian lucerne, the pest having been introduced with the seed. Prompt measures were taken, all affected plants being carefully cut out and burned. In the next cutting of lucerne, a very small quantity of dodder appeared. This was again carefully removed, and up to the present time there has been no fresh attack of this dreaded parasite.

The Rose-leaf Beetle made its appearance early in the present year. Its attacks were not confined to any particular species of plant, but it showed as a rule a preference for the more tender and succulent classes, such as rhubarb, plum-tree leaves, &c. Early in February the beetles came to the lucerne, confining their attack to the Arabian variety, this being softer and more juicy than the other kinds. Considerable damage was done, making it impossible to get the correct weight of Arabian lucerne for the April cutting.

The pest has since left the lucernes, though a number of the insects are still to be found on other plants.

The characteristics of the different varieties of lucerne as shown in their growth at Wollongbar are here given:—

Montana.—A variety very similar in type and general appearance to the variety grown from Hunter River seed. It was slow in making growth after sowing, but is now a rapid and vigorous grower, only surpassed by the Hunter River seed.

Turkestan.—This variety proved to be a rather slow grower, particularly at the start, the growth for some time being more like White Dutch clover than lucerne. As the plants grew older, the leaves gained the typical lucerne shape. Other varieties have these clover-like leaves when young, but this feature seemed to be more pronounced, and was retained longer, in the Turkestan than in the other varieties of lucerne.

Turkestan lucerne was outclassed in yield by nearly all the other varieties, and does not show any valuable qualities to recommend it for growth in this district in preference to other varieties.

Hunter River Lucerne, the check plot, has given excellent yields throughout the season, giving by far the heaviest returns of any variety under trial. The nearest approaches to it in point of yield were Arabian, in the early stages of the test, and Montana in the later.

Peruvian.—This lucerne differs slightly from the Hunter River variety, the leaves being narrower and smaller in proportion to the stem. The first growth of this variety was slow. In point of yield this lucerne was beaten by the Hunter River and Montana, being about equal to Sand, and better than the Turkestan and Arabian varieties.

Arabian.—While all the other varieties resemble the Hunter River type more or less closely, Arabian lucerne has several marked distinguishing features. The growth is more succulent, and the stems more watery, and with less fibrous matter in them, than in the common variety. The leaves are broader, more hairy, and rather paler in colour. The great feature, however, of this variety is the extraordinary rapidity of growth after cutting back, being several inches in height while the other lucernes are just beginning to shoot. The drawback to this variety is that it fails to mature under our conditions. After a height of about 15 inches is attained, the plant ceases to grow higher, and starts to sprout again from the roots without flowering. This is probably due to local conditions, as the plot was grown from seed which was evidently obtained from fully-matured plants. The yield does not compare favourably with those of the other varieties, but it appears that under favourable conditions this lucerne would produce a greater number of cuttings per season, and that the weight of lucerne would be greater per cutting than in the results obtained by us.

Sand.—This variety does not give quite such heavy yields as Montana. The growth is similar to that of lucerne grown from Hunter River seed. Up to the present, Sand lucerne has not flowered very freely, and is rather less fibrous and more procumbent than that grown in the check plot, but only to a slight extent.

TABLE OF RESULTS OF LUCERNE VARIETY TRIAL, WOLLONGBAR EXPERIMENT FARM, 1910–1911.

Variety.	30 May.		30 August.		28 October.		19 Dec.		28 January.		11 April.	
	Height.	Weight.	Height.	Weight.	Height.	Weight.	Height.	Weight.	Height.	Weight.	Height.	Weight.
	in.	lb.	in.	lb.	in.	lb.	in.	lb	in.	lb.	in.	lb.
Montana	..	17	12	65	20	118	20	128	22	120	20	114
Turkestan	..	18	10	48	17	86	18	109	18	112	18	98
Hunter River	15	56	18	84	24	142	24	151	24	150	24	136
Peruvian	..	34	10	68	15	98	20	118	21	124	20	112
Arabian	15	50	15	88	17	92	17	94	17	85	...	..
Sand	..	30	12	62	17	115	18	119	18	125	17	110

Height.—The average height of the plot in inches at the time of cutting.
Weight.—Number of lb. per plot of green lucerne, weighed immediately after cutting.

B.—Grafton Experiment Farm.

A. H. HAYWARD, Manager.

ON the 16th May, 1910, the seed of all the varieties was drilled in in rows 9 inches apart. All germinated well, and none proved a failure. One plot was planted with Tamworth lucerne seed for comparison.

Results are in the following order :—

Tamworth lucerne (check plot)	... ...	1st.
Arabian ,,	... ...	2nd.
Sand ,,	... ...	3rd.
Montana ,,	... ...	4th.
Turkestan ,,	... ...	5th.
Peruvian ,,	... ...	6th.

The Arabian variety is conspicuous for quick growth and heavy crop, but the stems are coarse. It is not so suited for haymaking as any of the others, but seems to be preferable for green feed and pasture.

It is reasonable to expect much better results with seed from these varieties, and it is my intention to try a small plot of each variety, alongside the imported seed.

C.—Hawkesbury Agricultural College.

A. V. DONNAN, Experimentalist.

THE different varieties were planted on 12th May, 1910, in sandy soil. Since then three cuts have been obtained, the results from the last of which have been discarded on account of variation due to outside influences.

The average yield of hay per acre of the two records is appended :—

Variety.	Tons per acre.	Variety.	Tons per acre.
Montana	1·44	Turkestan...	1·37
Peruvian	1·28	Sand	1·15
Arabian	1·34	Common	1·41

The following are the notes taken on their growth :—

MONTANA.—*Habit of growth:* Inclined to be procumbent; does not grow to the height of common lucerne. *Size of leaf:* Medium. *Proportion of leaf to stem:* Fair. *Stems:* Numerous, fine, and solid; no hollowness apparent. *Amount of growth:* Good. *Colour:* Dark green.

PERUVIAN.—*Habit of growth:* Inclined to be procumbent, being same as that of Montana. *Size of leaf:* Small. *Proportion of leaf to stem:* Good. *Stems:* Numerous, fine, and solid. *Amount of growth:* Medium. *Colour:* Dark green.

ARABIAN.—*Habit of growth:* Upright; grows to same height as New South Wales lucerne. *Size of leaf:* Very good, being longer but narrower than leaf of common lucerne. *Proportion of leaf to stem:* Good. *Stems:* Fair number of coarse, hollow stems. *Amount of growth:* Good. *Colour:* Light green. This variety begins to lose its colour before it is ready for cutting, consequently is not suitable for hay of good quality.

TURKESTAN.—*Habit of growth:* Very procumbent. *Size of leaf:* Small. *Proportion of leaf to stem:* Fair. *Stems:* Numerous, fine, and solid. *Amount of growth:* Indifferent to fair. *Colour:* Dark green.

SAND LUCERNE.—*Habit of growth:* Semi-upright or upright. *Size of leaf:* Medium. *Proportion of leaf to stem:* Fair. *Stems:* Fair number of stems, of medium diameter, inclined to be hollow. *Amount of growth:* Fair. *Colour:* Green.

So far, none of these varieties have shown themselves equal to the New South Wales broad-leafed lucerne. Resistance or susceptibility to diseases such as leaf-rust, was not noted specially in any of the varieties.

D.—Kangaroo Valley.

JAS. CHITTICK.

THE seed of the five varieties came up well. The variety named Arabian grew from the start more than twice as quickly as other varieties, and, so far as I can see, it is the quickest to come along after being cut. Some seed from Hunter River and Tamworth districts was also sown, but has not done as well as the Arabian. The other varieties have done only fairly well.

We kept the plots free from weeds, but the heavy rains in January last seemed to retard them. At the present time we are stirring the surface in an endeavour to restore the plants. Later on I may be able to report more favourably.

II.—TABLE-LAND DISTRICTS.

Reports have been received from Glen Innes and Bathurst Experiment Farms, and from Mr. Inspector Reynolds, respecting trials conducted by Mr. V. D. Cox, of Burrundulla, Mudgee. It will be noticed that the varieties tested by Mr. Cox were a different lot of seed to that tried elsewhere, and included French and German varieties.

A.—Glen Innes Experiment Farm.

H. BARTLETT, Experimentalist.

THE five varieties were sown on 13th September, 1910. The following remarks cover the first eight months of their growth; a further report will be furnished in twelve months' time:—

MONTANA.—*Germination*, fair; *growth*, very fair, partly spreading; *stool*, very fair; *leaves*, medium size, dark green; *hairs*, short; liable to leaf-spot; *yield of greenstuff* (cut 10th February, 1911), 8 lb.

SAND.—*Germination*, very poor; *growth*, very fair, spreading; *stool*, very good; *leaves*, medium size, medium green colour; *hairs*, short; liable to leaf-spot; *yield of greenstuff* (cut 10th February, 1911), 4 lb.

TURKESTAN.—*Germination*, fair; *growth*, good, spreading; *stool*, good; *leaves*, medium size, dark green colour; *hairs*, short; leaf-spot slight; rust slight; *yield of greenstuff* (cut 10th February, 1911), 12 lb.

PERUVIAN.—*Germination*, very good; *growth*, good, spreading; *stool*, very good; *leaves*, very small, dark green; *hairs*, very short; leaf-spot slight; *yield of greenstuff* (cut 10th February, 1911), 19 lb.

ARABIAN.—*Germination*, good; *growth*, very fair, erect; *stool*, very fair; *leaves*, large, light green, very hairy; leaf-spot rather bad; *yield of greenstuff* (cut 10th February, 1911), 10 lb.

The most promising of these lucernes are Peruvian, Turkestan, and Sand. The yields of greenstuff are hardly comparable, owing to the poor germination of some varieties. It is intended to transplant where germination has failed.

B.—Mudgee.

MARK H. REYNOLDS, Inspector of Agriculture.

ON 9th September, 1909, Mr. V. D. Cox, Burrundulla, Mudgee, sowed 2 lb. each of the following varieties of lucerne seed:—German, French, Turkestan, Hunter River, and Provence. On 24th September, 2 lb. of Queensland seed was sown. Each plot is 4 chains by 8 yards.

On 4th December, 1909, all varieties were mown. Between December, 1909, and 31st March, 1910, the plots were mown twice.

On 29th May, 1910, a remarkable difference in the growth of the several varieties was noted since the mowing during the latter part of March. The Queensland and Hunter River varieties were almost a foot high—a good growth for the time of year. The French and Provence were 3 or 4 inches high. The Turkestan and German showed no new growth, and looked as if they had been cut a day or two before.

The two last-named varieties, up to 29th May, 1910, had not done as well as the others. They are very much alike. They have a broad leaf, and look very mashy—more like clover in the leaf.

On 22nd February, 1911, all varieties looked well and healthy, and were coming into flower. They had been cut twice since the winter of 1910. The Provence and Hunter River showed most growth. Mr. Cox stated that

the Hunter River is the best; the Provence makes a fine hay, very leafy right along the stem, and is well worth growing. The Queensland is also very promising.

In weight of hay per acre, the order of production to date is: Hunter River, Queensland and Provence, French, German, and Turkestan. I hope to have the time, now that the lucernes are well established, to check the weights of each cut from the coming spring until winter following.

On 9th December, 1909, I received ¼ lb. each of the following varieties of lucerne: Arabian, Peruvian, Turkestan, Montana, and Sand. I made arrangements with the Manager of the Towri Estate, Maryvale, to sow this seed. He did not make a sowing in the autumn or spring of 1910, as he considered the weather conditions most unfavourable. A plot has been prepared for the lucernes this autumn.

C.—Bathurst Experiment Farm.

R. W. PEACOCK Manager.

THE following lucernes were sown upon the uplands at this Farm on the 3rd February, 1910, together with New South Wales lucerne:—Arabian, Sand, Turkestan, Montana, and Peruvian.

Owing to the dry weather since sowing, the growth was limited, and not sufficient to cut for hay, to calculate the respective yields. They were grazed twice by sheep.

From notes taken during their growth, New South Wales grew more vigorously, and appeared hardier than the others. Arabian appeared to suffer more than the others by the dry weather. Turkestan lucerne was taller and more vigorous than Sand lucerne. Montana was much the same as Turkestan. The Peruvian appeared to be slightly better than the two former during the first seven months.

The most vigorous second growth after feeding-off was made by New South Wales lucerne, and the least vigorous by Peruvian. At present (3rd May, 1911) they are all suffering from the dry weather. New South Wales lucerne is doing the best.

III.—WESTERN SLOPES.

The only report yet received from this section of the State is from the Cowra Experiment Farm. Other plots have been sown by farmers at Tamworth in the north, and Adelong in the south.

A.—Cowra Experiment Farm.

A. E. DARVALL, Acting Manager.

THE five varieties were all planted on 18th October, 1910, and all germinated excellently. On account of not having time to develop a good root system before the hot summer weather set in, they only made a short growth.

Arabian proved to be the most vigorous grower. It is also of a coarser growth than any of the others, all of which closely resemble each other in both their appearance and the growth made.

IV.—RIVERINA.

The two localities in which plots were sown were Wagga and Yanco, both being at the Department's Experiment Farms. At Yanco (the testing-ground for the Burrinjuck Irrigation Scheme), the plants were irrigated twice.

A.—Wagga Experiment Farm.

R. W. McDIARMID, Experimentalist.

Montana.—Seed sown, 17th August, 1910; germinated, 30th August. Germination, good Growth, very poor. Stooled fairly well. Appears to be firm in stem and leaves. Does not stand dry weather.

Peruvian.—Sown, 17th August, 1910; germinated, 30th August. Germination, good. Best looking variety on 21st January, 1911. Stooled well. Fine. Appears one of the best. May do well next year.

Turkestan.—Sown, 17th August, 1910; germinated, 30th August. Germination, good. Stooled fairly well. Suffers with dry weather. Appears to be fine. May do better next year.

Arabian.—Sown, 17th August, 1910; germinated, 30th August. Germination, fair. Worst looking plot on 21st January, 1911. Very nearly dead on 12th and 27th April, 1911. Poor stooler. Appears to be coarse. Suffers worst from dry weather.

Sand.—Sown, 17th August, 1911; germinated, 30th August. Germination, very good. Stooled well. Not very coarse. May do well next year. One of the best this year.

None of the above varieties have done as well as Tamworth lucerne grown under similar conditions.

B.—Yanco Experiment Farm.

G. S. RIDLEY, Experimentalist.

THE following notes are extracted from our Lucerne Variety Trial Records:—

BLOCK XI, SECTION A, 1910 SOWING.

Previous Treatment of Area.

1908.—Cleared and scarified to 10 inches. Site, flat-edge of a large clay pan with very little depth of surface soil (4 to 6 inches).

1909.—July: Ploughed 5 inches with mould-board plough.

August: Double-disced twice.

Cultivation.

1910.—August: Land which had since being lying as unworked fallow, cultivated twice with spring-tine cultivator.

September 9: Sown with varieties of lucerne. This was done with an onion-seeder, in rows 4 feet apart. Land between rows cultivated after rain and after irrigations.

TABLE SHOWING PROGRESS RECORD, LUCERNE VARIETY TRIALS, 1910 SOWINGS, YANCO EXPERIMENT FARM.

No. of Row.	Area.	Variety.	Source of Seed.	Date sown.	Area harvested	* Yields (Hay). 26 Jan., 1911, to 20 Feb., 1911. Actual lb.	per ct	20 Feb., 1911, to 25 March, 1911. Actual lb.	per ct	3 March, 1911, to 25 March, 1911. Actual lb.	per ct.	25 March, 1911, to 20 April, 1911. Actual lb.	per ct.
1 12	1 row, 430 feet long	Tamworth (N. S. W.)—"Best local seed obtainable."	Anderson & Co., Seed Merchants, Sydney.	9th September, 1911.	1 row, 2 chains long, 4 feet wide.	13·5	100	14·62	100	17·43	100	16·605	100
2 13	,, ,,	Peruvian	Seed Branch, Department of Agriculture, N.S.W., from Department of Agriculture, Washington, U.S.A.			6·75	50	4·5	30·8	5·43	31·2	Too low to cut.	
3 14	,, ,,	Montana				11·81	87	11·81	80·8	12·12	69·2	8·14	49
4 15	,, ,,	Sand				11·25	83	13·5	92·3	12·37	70·9	8·14	49
5 16	,, ,,	Turkestan ...				10·12	75	13·5	92·3	11·25	64·5	Too low to cut.	
6 17	1 row, 200 feet long	Arabian				9·28	68·75	11·81	80·8	16·31	93·5	16·78	101·5

* Actual weight from row 2 chains long, and percentage this bears to yield of check-row 12 for same period.

Summary of Notes from Field Book.

1 Best stand for amount of seed sown.

2 Narrow leaves, fine stalks, light greyish colour, slowest grower. Plants do not conform to description of Peruvian Alfalfa in Bulletin 118, Bureau of Plant Industry, U.S. Department of Agriculture.

3 Narrow leaves, fine stalks. Sturdier and darker than Peruvian, also slightly more vigorous grower.

4 Branching, very leafy and succulent; but "bunchy" growth, and out of reach of mower.

5 15 February, 1911.—Branching and a little stocky. 20 April, 1911.—Very similar to Sand lucerne at present time; even more leafy and out of reach of the mower.

6 Broad leaves, fine stem, upright growth. "Comes away" more quickly than all other varieties after being cut. Once past stage for cutting, however, it commences to "go off," and is attacked by fungous disease, while other varieties were not attacked at all. Conforms to description of Arabian Alfalfa in Bulletin 118, Bureau of Plant Industry, U.S. Department of Agriculture.

Irrigation.

Area irrigated by furrows between rows, 4th December, 1910, and 5th April, 1911.

Rainfall Affecting Yields Recorded.

Cuttings also made December, 1910, and 26th January, 1911.

Previous to 26 January, 1911 (January falls only).	1st cut 26 January, 1911, to 20 February, 1911.	2nd cut. 21 February, 1911, to 25 March, 1911.	3rd cut. 3 March, 1911, to 25 March, 1911.	4th cut. 25 March, 1911, to 20 April, 1911.
5 Jan., 22 pts....	26–31 Jan., nil .	26 Feb., 1 pt.	8 Mar. 120 pts.	Nil.
6 ,, 69 ,, ...	4 Feb., 9 pts.	28 ,, 33 pts.	10 ,, 1 ,,	,,
13 ,, 109 ,, ...	7 ,, 10 ,,	8 Mar. 120 ,,	14 ,, 35 ,,	,,
14 ,, 60 ,, ...	10 ,, 114 ,,	10 ,, 1 ,,	19 ,, 13 ,,	,,
18 ,, 22 ,, ...	11 ,, 7 ,,	14 ,, 35 ,,	20 ,, 5 ,,	,,
22 ,, 4 ,, ..	14 ,, 43 ,,	19 ,, 13 ,,	....	,,
....	16 ,, 2 ,,	20 ,, 5 ,,	. ...	,,
	Total ...185 pts.	Total ...208 pts.	Total ...174 pts.	Nil.

Yields.

The attached table shows the yields of the five varieties, and of the Tamworth lucerne used as a check. The yields are not strictly comparable, as the seed of the varieties was not equal in germinating percentage, and the rows were not thinned out to an equal number of plants per foot; but they are the actual yields from equal sowings.

GENERAL REMARKS.

It will be noticed that in the vast majority of cases the best results are obtained from local seed. This was to be expected; and it will serve to emphasise the advice which is given by all authorities on lucerne, namely, to use acclimatised seed. Even if one or more of the imported varieties should ultimately prove to be far superior to local varieties, the superiority will probably not be evident until seed has been harvested from the plots and planted again.

From the standpoint of the farmer, this is a matter of considerable importance. Foreign seeds are often placed on the market at cheaper rates than local seed. In almost all cases, foreign seed is dear at any price, as the yield will not approach that obtained from locally-grown seed. The acclimatising of foreign seed is not a work from which a farmer may hope to obtain much profitable return; it should be left to the Department of Agriculture. The farmer who is sowing lucerne should demand from the seedsman guarantees that the seed is free from dodder and other bad weed seeds, as well as from insect pests and fungous diseases; that it has a good germination percentage, and that it was *grown in New South Wales.* To the credit of our leading seedsmen and seed-growers it may be said that such guarantees are freely given.

The Wild Passion-fruit Weevil.

(*Œmethylus triangularis*, Lea.)

WALTER W. FROGGATT, F.L.S., Government Entomologist.

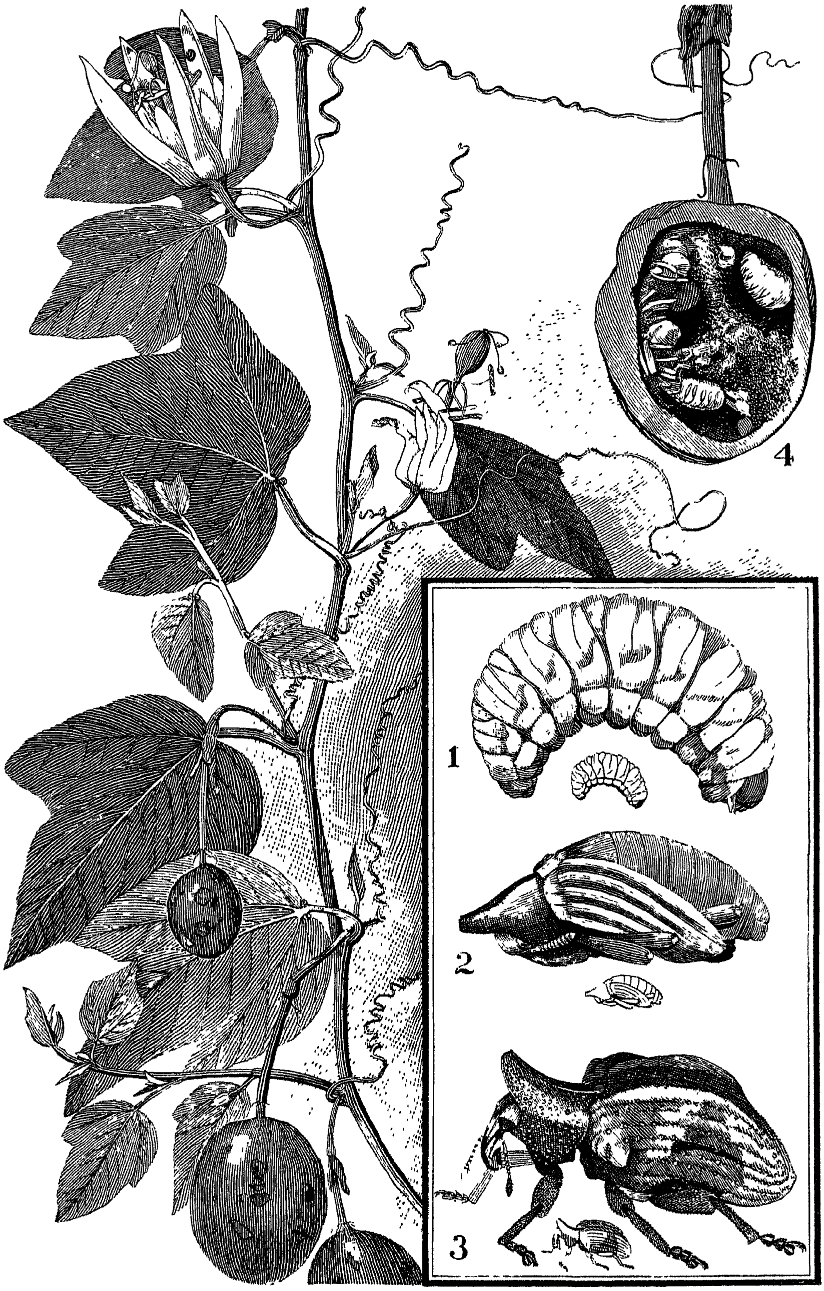
THIS curious weevil has been found infesting the fruits of the wild passion-vine (*Passiflora herbertiana*) over a very large area. Its range is probably that of its food plant, which grows throughout the semi-tropical scrubs, where the passion-vine may be seen trailing over the low scrub trees, covered with flowers and fruit in all stages of development.

Mr. Lea informs me that he has had this beetle from the scrubs on the Tweed and Richmond Rivers; and as the passion-vine extends into Queensland, if not recorded it will probably be found in the adjoining State. He says that the specimen of the beetles on which he founded the species was among specimens sent to him for determination from the Berlin Museum. Mr. C. T. Musson, of the Hawkesbury Agricultural College, also sent me specimens of infested passion-fruits growing in the scrubs on the Kurrajong, near Richmond.

Later on, during a visit to Hogan's Brush, near Gosford, Inspector Gallard drew my attention to the way in which every fruit on the wild passion-vines was punctured and scarred by the adult weevil ovipositing in the skin of every fruit, from the smallest to the full-grown specimens. The beetles had been previously bred at the Narara Insectarium. I collected a large series of infested fruits, containing larvæ and pupæ in all stages of development, and gave them to the artists to draw; for I consider that the life history of a beetle which might at any time turn its attention to the more hard skinned cultivated passion-fruits, growing in the adjacent orchards, should be fully explained and recorded.

This remarkable-looking weevil is of a uniform greyish-brown tint, except that on either side of the wing covers, above the base of the second pair of legs, there is an angular reddish-brown blotch. On the upper surface of the prothorax, there is a small black spot on either side, which, with the curious shape of the angular prothorax, and the small yellow pronotum in the angle of the clytra, gives a caricature of a face when viewed from above. When at rest the legs are closely folded; the head is turned down, and fitting close against the under-surface of the prothorax, is completely hidden by the bluntly-pointed angular thorax projecting in front. The thorax and wing-covers are ribbed, with shallow irregular punctures and very fine grey scales. On the under-surface and legs these grey scales are larger, and there are also some fine hairs. The weevil measures $\frac{2}{5}$th of an inch in length from the point of the projecting thorax to the tip of the abdomen, but the largest specimens may reach to half an inch.

I know of no other weevil for which this could be mistaken, on account of its remarkable form, as shown in the plate; but Mr. Horace Brown tells me that he has bred another species from the fruits of wild passion-fruits on the Northern Rivers.



The Wild Passion-fruit Weevil (*Œmethylus triangularis*, Lea.)

1 Larva 2. Pupa. 3. Beetle 4. Spray of Wild Passion Vine, and cross section of fruit showing larvæ.

The larva is a white, legless grub, with a very small, rounded, dark yellow head, and dark jaws. The segments of the body are much corrugated, and narrowest towards the anal segment, with the body curved round when at rest, after the manner of so many weevil larvæ

These grubs, even when there are several on a single fruit, do not seem to move about much, but simply feed and grow in the tissue surrounding them, so that they do not destroy all the seed in any fruit before pupating.

At this stage it is of a uniform creamy white tint, with the head, legs, and wings folded close along the body, and even in fruit that is gathered green and allowed to shrivel up it will pupate without any trouble among the decaying pulp and seeds.

Suggestions.—In the event of this beetle attacking cultivated passion-fruit, it would not be a difficult pest to deal with, as the scars upon the surface of the fruit are very conspicuous, and the infested fruit could be easily gathered and destroyed before the beetles emerge. As we know the food-plant, we would know where to look for the beetles, and the beetles could be kept in check by gathering the fruits or destroying the wild passion-vines.

Maize and Weevils.

In the *Gazette* for July, 1909, page 611, it was stated that investigations were to be made respecting the immunity from infestation by weevils which is claimed for maize grown at Tumut. A number of samples of maize were received at the Entomological Branch from the Tumut district, Grafton Experiment Farm, and West Maitland district in July, August, and September, 1910, and placed in jars.

The Tumut samples were supplied by Dr. Mason, and comprised Dr. Mason's own seed, Hickory King, Iowa Silvermine, Sibley, Early Yellow Dent, and Leaming. The varieties received from Grafton Experiment Farm were Yellow Dent, Small Horsetooth, and Large Horsetooth. Mr. G. S. Bowden, West Maitland, supplied Golden Drop, Small Hogan, Large Yellow, and Red Hogan.

These samples were all examined on 11th July, 1911, so that most of them were undisturbed for twelve months. It was found that all the samples from the Northern Rivers district were infested with moth or weevil. None of the Tumut samples showed any infection. A small *Psocid* swarmed in the Hickory King, gnawing out the soft ends, but this might be an accidental infestation. With this small exception, the Tumut samples were all fine, clean maize, with no infection of any kind. Some of the West Maitland varieties were just as good and clean as the hard Tumut kinds, while others were badly infested. But when weevils were placed in the jar containing clean Tumut maize, it very soon became as badly infested as any of the Northern maize. The Government Entomologist is experimenting in this direction.

It is proposed now to take the same kinds that are grown in Tumut district, and plant them at Maitland and the Experiment Farms in the Northern Coastal districts, in order to ascertain the relative infection of the Tumut varieties in each district. There is a great deal of interesting information to be gained in finding out the resistance of the different varieties to weevil and moth, and whether the hard varieties grown at Tumut, West Maitland, and elsewhere become soft and weevil-infested when grown in the north. The apparent resistance seems to be due partly to the climate and partly to the variety of maize.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

TUBERCULOSIS IN CATTLE.—" Inquirer " had a milking cow suffering from tuberculosis of the glands of the throat. He destroyed her eight months ago. Her droppings are all over the paddock (100 acres) and about the yard. No cattle have been in the paddock since the tuberculous beast was destroyed. He asks would it be safe to put another cow in the paddock now?

The veterinary officers of the Stock Branch state that the danger of another cow contracting the disease under the above circumstances may be regarded as negligible.

CITRUS FRUITS AND ALMONDS IN THE NORTH-WEST.—"H.G." (Barraba): Oranges and lemons should do fairly well in your district, especially on the lighter and richer soils. It might be necessary to irrigate at times during the long dry summers. The following varieties might be tried :—*Oranges:* Washington Navel, Thompson's Improved Navel, Valencia Late, Joppa. *Lemons:* Lisbon, Villa Franca, Messina.

The best varieties of almonds may be worked on either peach or almond stock. To raise the stocks it is necessary to plant the seeds immediately in well-prepared loamy soil, to a depth of 2½ or 3 inches. Under ordinary conditions these should come up and be large enough to bud next fall. Two or more varieties should be grown in close proximity to ensure proper pollination. Buds of the following sorts only should be used:—Paper Shell, Ne Plus Ultra, Hatch's Nonpareil, Brandis. If desired, grafted trees might be obtained from almost any of the metropolitan nurserymen.—W. J. ALLEN.

LIMING NEW POTATO LAND.—"J.E.D." (Batlow) had samples of his soil analysed by the Departmental Chemist, and was advised to apply lime. He hesitates to do so, as he has seen results of experiments in Scotland, showing that liming diminishes potato yields. He is working on virgin country. In land which is heavily covered with green timber it is generally found that the land is more or less sour for some time after the clearing is completed, and everything should be done to sweeten it up by exposing it to the air and by liming. For potatoes it is inadvisable to lime unless the land can be allowed to remain some months without crop after the lime is applied.—GEO. VALDER.

RHODES GRASS.—" M.R." (Gundagai): As a rule, in this district, the best results would be obtained from autumn sowing of Rhodes grass, say, in March or April. Two to three pounds of seed are usually sufficient per acre. As with all seeds, it is best to sow with a drill, but in order to sow at the above rate per acre, it would be necessary to mix the seed with sand or dry earth. It is best to prepare the land in much the same way as for wheat, except that a finer tilth is desirable. The depth to plough depends upon the soil. With most soils, from 4 to 6 inches is the average depth to plough. If your soil is a deep one, I would advise ploughing 6 inches deep.—GEO. VALDER.

PROPAGATING CITRUS TREES.—" A.B.C." (Gosford) wishes to bud citrus trees on common lemon stocks. He has some vigorous young seedlings, and asks for advice as to transplanting. When transplanting it is advisable to remove part of the top of the stock, and where the roots are very long a portion might be removed, but if they are only about a foot long they need not be touched. The bud should be selected from the centre of the scion, not at the base. One without a thorn is preferable if available.

Articles on budding and grafting appeared in the *Gazette* for January and February, 1911. If the correspondent has not these numbers, and supplies his full address, a pamphlet will be forwarded to him.—W. J. ALLEN.

GROWING MAIZE IN HOT, DRY DISTRICTS.—" R.W.S." (Parkes): In hot, dry districts, such as that of Parkes, the best way to plant maize is that known as the Lister system. The land is well ploughed and prepared, and then furrows, at least 4 to 6 inches deep, are struck out at the proper distance apart for sowing. In these furrows the maize is planted at the bottom with an ordinary corn planter. The subsequent cultivation given to the crop fills up these furrows, and this does instead of hilling, allowing of flat cultivation, which is the best method of preventing evaporation.—GEO. VALDER.

MAIZE AND GRASSES ON THE RICHMOND.—" A.W.S. " (Lismore): The varieties of maize which have given the best results so far are Yellow Dent and Early Leaming. These should be sown in drills, from 3 to 4 feet apart, and well cultivated between the drills. As a rule, for silage, we sow about 20 lb. of maize per acre. Rhodes and paspalum grass should be sown as soon as possible, and it is a good plan to sow a few pounds of clover over the areas in the autumn, harrowing in the seed. By this means clover will supply fodder at a time when the other grasses are dormant. There are other grasses worthy of trial in the district, but before sowing them you should visit the Wollongbar Experiment Farm, 8 miles from Lismore, where you will receive advice as to the sowing of fodder crops and the conservation of same.—GEO. VALDER.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Bathurst	Mr. S. McKibbin, O'Connell.
Bonville	Mr. H. B. Faviell, Bonville.
Carlingford	Mr. D. K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown .. .	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Frogmore	Mr. W. Thompson, Forest Creek, Frogmore.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla ...	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. A T. Redden, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Milbrulong	Mr. O. Ludwig.
Nelson's Plains ...	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H Basedow, Orchard Hills, *viâ* Penrith.
Parkes...	Mr. John E Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

Carlingford.

At a recent meeting of the Bureau, Mr. H. J. Rumsey gave a lecture on "Tomato and Vegetable Growing." He showed what could be done on a small area with intense culture, and how productive the cultivation of an area of vegetables could be made if the soil were well manured, properly drained, and the moisture conserved by thorough cultivation. He dealt with the propagation of new varieties of tomatoes, the production of early fruit, and the combating of pests and diseases

Dubbo.

A branch has recently been formed at Dubbo, of which Mr. T. A. Nicholas is the Honorary Secretary. Farmers in the district wishing to join should communicate with that gentleman. Mr. Inspector Reynolds gave a lantern lecture on the 13th September, on "Wheat Culture and Fallowing."

Katoomba.

This branch has asked for a lecture on "Horse-breeding and General Treatment of Horses," and in compliance a veterinary officer will lecture on the "Breeding and Care of Horses" on either 13th or 27th October, whichever date it is thought will be more convenient to members.

Keepit.

At a meeting held on the 2nd September, the annual subscription was fixed at 2s. Four new members joined, viz., Messrs. W. Gardner, R. Gardner, B Allen, and W. Shaw.

The Inspector of Agriculture, Mr. A. H. E. McDonald, delivered a lecture on "Wheat-growing." The next meeting will be held at the Keepit Public School on the 14th October, when a discussion will take place on "Horse-breeding."

Kellyville.

A strong branch has been organised at this place, with fifty-two members. The Chairman is Mr. Harry Firth; Vice-Chairman, Mr. C. Boughton; Hon. Treasurer, Mr. D. Kearney; and Hon. Secretary, Mr. A. J. Redden, of "Hill View," Kellyville. The subscription is 1s. per annum Application has been made for the use of the Public School, in which to hold the meetings.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a lantern lecture to the members on the 15th September, on "Fruit Pests and their Treatment."

Little Plain.

Mr. F. S. Stening, of Little Plain, has been elected Honorary Secretary of this branch.

At a late meeting, Mr. E. Blyth read a paper on "Farmers' Sheep," in which he recommended the Lincoln-Merino as a suitable cross-bred ewe for raising early lambs by Shropshire sires. These ewes, if properly bred, should produce 9 or 10 lb. of wool, the fleece portion of which has lately been bringing 1s. per lb. and over, when sold in 10 or 20 bale parcels. The lambs, if well fed, should weigh 40 lb. at four months, and net about 10s. per head when sold for export. Mr. Blyth urged farmers to breed their own cross-bred ewes, as those offered at local sales are seldom the best. Moreover, cross-bred sheep are less likely to break fences and wander away when bred on the place.

At the meeting on 7th September, the subject for discussion was "Potato-growing."

Milbrulong.

At the last meeting, Mr. F. Gellasch gave his experience in "Wheat-growing." Well-cleared ground, mould-board ploughs, 4-inch ploughing, graded seed, and superphosphate were the main factors in his success.

Nelson's Plains.

Mr. Pedersen gave a lecture on the 7th September, on "The Advantages of Herd-testing Associations."

Stockinbingal.

In continuation of the instruction given by the Sheep and Wool Expert during the recent course of lectures, arrangements have been made for the members of this branch to visit the Wagga Experiment Farm, and inspect the shearing and the crops. Mr. Mathews will be at the Farm on the 3rd October, and will be pleased to meet any of the members on that date.

Tallawang.

At a meeting held at Tallawang School, on the 19th August, a branch of the Agricultural Bureau was inaugurated. Mr. T. Collins was elected Chairman; Mr. J. O'Brien, Vice-Chairman; Mr. W. Collins, Honorary Treasurer; and Mr. T. Collins, Honorary Secretary.

Walli.

The Sheep and Wool Expert, Mr. Mathews, is to meet the members of the Walli Branch at Cowra Experiment Farm on 6th October, when they will view the shearing and inspect the crops, and be able to see how the wool is handled for market.

Wyan (*viâ* Casino).

A branch has been formed at Wyan, Richmond River, with twenty-three members. The Chairman is Mr. A. Burnett; Vice-Chairmen, Messrs. James Bailey and G. Lollback; Honorary Treasurer, Mr. Henry Clark; and Honorary Secretary, Mr. C. W. Harper.

At the meeting held on 24th August, the subject for discussion was "Lucerne."

Yass.

The recent course of lectures and demonstrations given by Mr. Mathews, the Departmental Sheep and Wool Expert, was so appreciated by the members that at their request, and in continuation of the instruction then given, arrangements are being made for a visit to the Wagga Experiment Farm, for the purpose of inspecting the sheep and seeing the farm crops. Mr. Mathews will be at the Wagga Farm on the 3rd and 4th October, and members are invited to pay a visit to Wagga on those dates, when shearing will most likely be in full swing.

The branch is obtaining opinions, based upon experience, from members of other branches throughout the State, as to the efficiency of several methods of controlling the blow-fly pest, such as crutching ewes, leaving lambs' tails longer, &c. Hopes are entertained that some practical method of coping with the pest will be eventually discovered.

On the 14th September the Departmental Veterinary Surgeon delivered a lantern lecture on "Diagnosis of Tuberculosis."

Orchard Notes.

W. J. ALLEN.

OCTOBER.

Cover Crops.

WHERE green-manure crops have not already been turned in, this work should be finished as early as possible now, as there is always the chance of the season proving a dry one, in which event such crops would soon remove the moisture from the ground, and render it almost impossible to plough properly. Where the soil turns up lumpy and dry, the crop will not rot in the same way as it would were the ground in a good moist condition at time of ploughing.

Cultivation.

Throughout the spring and summer months, occasional cultivation should be given to orchards and vineyards; also after each rain the ground should be well worked to conserve as much moisture as possible, and prevent excessive evaporation. Under no circumstances should this important work be neglected. The soil around the base of all trees and vines should be loosened up to a good depth with a pronged hoe in the early spring, and occasionally during the summer, and any suckers found growing on either trees or vines should be removed.

Fighting Codlin Moth and other Pests.

Growers of apples and pears should spray their orchards systematically with arsenate of lead, in order to protect the fruit from the ravages of codlin moth. It has been proved time and again, that those who spray systematically, bandage, and pick up and destroy all fallen and infested fruit, succeed in harvesting over 90 per cent. of clean fruit, while those who neglect spraying are lucky if they succeed in harvesting 40 per cent. of clean fruit.

To comply with the regulations under the Fruit Pest Act, it is necessary to attach the bandages to all apple, pear, and quince trees now, and those who fail to do so render themselves liable. It has been found that either a copper nail or a large shawl pin is the best and most simple means of fastening on the bandages.

Black Spot of the Apple and Pear.

It is now too late in most places for the winter dressing, which should be applied a few days before the trees burst into leaf and bloom. The second

The proper time for first spraying of apple trees with arsenate of lead. The petals have fallen, and the young fruit is forming.

spraying should be given as soon as the fruit is well set, and may be used in conjunction with arsenate of lead. For the first application, before the tree bursts into bloom, the following solution may be used :—

Copper sulphate (bluestone)	6 lb.
Lime	4 lb.

made up with 22 gallons of water; while for the second spraying it may be diluted to 50 gallons.

Be careful to see the mixture is thoroughly prepared, and that it is not applied when the trees are wet or during rain, as we have found that russetting occurs if this precaution is not taken.

Rather late for first spraying. The calyx is almost closed.

In spraying, use as fine a nozzle as possible, and see that the whole of the tree, leaves, and fruit are covered.

Dormant Buds and Grafts.

Keep all worked stock well disbudded, never allowing suckers to grow where either bud or graft is doing well. If the stocks on which buds were inserted have not been cut back, this should be done without further delay.

The cut should be slanting, being slightly lower on the side opposite the bud; and it is advisable to stake them, not only to prevent their being blown out, but also to encourage a straight trunk.

Where grafts have been put in old trees, they must be tied to prevent their being blown off. To do this, a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then as the graft grows, it can be tied to it.

Keep a strict watch on all refills and young trees, and if these show any signs of wilting, give them one or two buckets of water from time to time until they get a good start. Disbud all newly-planted trees, leaving three or four good shoots, at least 4 inches apart, along the trunk of the tree. Do not allow two or three shoots to start from the same place, but give each branch a separate hold of the main stem. While working around trees, watch for borers on the trunks and branches, as it is very easy, when they are just starting their work, to cut away the bark and find them, thus keeping the orchard free of this pest.

Pruning of the old citrus trees may be completed this month.

Lime-Sulphur Spray for Peach-trees.

Mr. C. P. Scrivener, Kookatonga, Mount Irvine, writes that he has been using the lime-sulphur solution for the past two seasons in preference to the lime-sulphur-salt spray. Mr. Scrivener finds that the new mixture is easier to apply and sticks better, and seems to give good results. Owing to the apple trees and fruit being severely burnt last season with the bluestone-soda spray, Mr. Scrivener intends using the lime-sulphur as a summer spray this season.

The following directions are given in Bulletin No. 2 of the Missouri State Board of Horticulture.—"Spraying for the control of Peach Brown Rot and Scab," by W. M. Scott, Pathologist, United States Department of Agriculture:—

After petals drop, spray with 8·8·50 self-boiled lime-sulphur.

A month before the fruit ripens, spray with 8·8·50.

Preparation.—8 lb. fresh stone lime and 8 lb. of sulphur to 50 gallons of water.

Place the lime in a barrel, and pour on enough water to almost cover it. As soon as the lime begins to slake, add the sulphur, which should first be run through a sieve to break up the lumps. The mixture should be constantly stirred, and more water added as needed to form a thick paste at first, and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as it is well slaked water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted and applied.

It is very important, especially with hot lime, to cool the mixture quickly by adding a few buckets of water as soon as the lumps of lime have slaked down. The intense heat, violent boiling, and constant stirring result in a uniform mixture of finely divided sulphur and lime, with only a very small percentage of sulphur in solution.

NOTE.—When making the lime-sulphur solution at the Government orchards, we have found it necessary to cook the wash much longer than is recommended by Mr. Scott.

Department of Agriculture,
Sydney, 3rd October, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

JERSEYS.—Patron: sire, Calceolaria's Lad; dam, Lady Pat; calved 27th September, 1910; colour (whole), dark fawn. Price, **£25.**

Lady Pat is from Pattibelle by Sir Jack. Pattibelle from Claribelle (imp.) by Lily's Boy (Vol. IX, p. 86, E.J.H.B.).

The Sphinx: sire, Calceolaria's Lad; dam, Sailor's Pride; calved 7th October, 1910; colour, fawn and white. Price, **£20.**

Sailor's Pride is from Egyptian Belle by Sir Jack. Egyptian Belle is from Egyptian Princess (imp.) by Tidy Punch, from Lady Tidy III, by Melbourne Punch.

Blue Spec: sire, Berry Melbourne; dam, Lally Optician; calved 29th July, 1909; colour, whole. Price, **£30.**

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.). Lally Optician is by Sir Jack from Bellona; Bellona by Optician (imp.) from Pattibelle (192, A.J.H.B.). Sir Jack is by Omelette's Pride from Lady Tidy III (imp.). Sir Jack realised 170 guineas at auction at Sydney Royal Show, 1910.

AYRSHIRE.—Byron: sire, Auchenbrain Spicy Jock (imp.); dam, Julia; calved 25th January, 1909; colour, brown and white. Price, **£20.**

Julia is by Peacemaker from Juliette. Juliette by Mischiefmaker of Barcheskie (imp.) from Judy IX of Barcheskie (imp.).

SHORTHORN.—Duke of Kent: sire, Royal Hampton X (imp.); dam, Dora's Flower; calved 16th May, 1910; colour, red. Price, **£25.**

Dora's Flower is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy.

WOLLONGBAR EXPERIMENT FARM.

GUERNSEY.—Lord Hopetoun: sire, Parson's Hope; dam, Souvenir of Wollongbar; calved 24th October, 1910. Price, **£45.**

JERSEY.—Maro: sire, First Choice; dam, Marjory Newman; calved 27th August, 1910. Price, **£20.**

GRAFTON EXPERIMENT FARM.

RED POLL.—The Judge (Stud bull): sire, Barrister (imp.); dam, Lovely VIII; calved 13th February, 1901. Price, **£15.**

WAGGA EXPERIMENT FARM.

AYRSHIRE.—*Argyle of Wagga: sire, Alice's Bull; dam, Trilby II of Coolangatta; calved January, 1908. Price, **£15 15s.**, on boat or rail in Sydney.

Alice's Bull, by Prince Emerald (imp.), 342, from Alice of Oakbank, 406. Trilby II of Coolangatta is by Glen Elgin's Zulu, 302, by Rob Roy, 149, from Trilby of Coolangatta. Grace, the g.g.d. of Argyle of Wagga, was bred by Mr. James Wilson, of Berry, N.S.W., from an Oakbank cow.

Trilby II of Coolangatta gave 5,226 lb. milk on second calf.

H. C. L. ANDERSON, Under Secretary.

*Applications for this bull will be held till 21st October. If more than one application be received, his disposal will be decided by ballot.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn	Pansy's Progress	Dora's Boy	Pansy 4th (imp).	Wollongbar Farm	*
,,	March Pansy	Earl March	Australian Pansy.	Grafton Farm	*
,,	Limerick Lad (imp.)	....	....	Berry Farm	*
,,	Royal Pansy	Royal Hampton 10th (imp.).	Australian Pansy.	Pyagarah	11 Mar., '12.
Jersey	Thessalian II.	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,,	Jamaica Jack	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
,,	Xmas Fox (imp.)	Silver Fox	Malvoisie	Berry Farm	*
,,	Kaid of Khartoum	Sir Jack	Egyptian Belle	Yanco Farm	*
,,	Drenadin	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm	*
Guernsey	Gentle Prince	Rose Prince (imp.)	Gentle (imp.).	Trevallyn	31 Oct., '11.
,,	The King's Mirror.	Calm Prince	Vivid (imp.)	Lismore	26 Nov., '11.
,,	Star Prince	Calm Prince	Vivid (imp.)	,,	1 Jan., '12.
,,	Sky Pilot	Prince Souvia	Parson's Red Rose (imp.).	Palmer's Island	15 April, '12.
,,	Prince Souvia	Vivid's Prince	Souvenir (imp.)	Casino	11 Jan., '12.
,,	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Feb., '12.
,,	Monsieur Beaucaire.	Calm Prince	Flaxy (imp.)	Grafton Farm	*
,,	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,,	Claudius	Golden Star II.	Claudia's Pride (imp.).	H.A. College, Richmond	*
,,	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail	Port Macquarie	20 Dec., '11.
,,	The Peacemaker	Calm Prince	Rose Petersen	Berry Farm	*
,,	King of the Roses	Hayes' King	Rosey 8th (imp.).	Singleton	21 April, '12.
,,	Calm Prince	Rose Prince (imp.).	Gentle (imp.).	Berry Farm	*
,,	Royal Preel	Itchen Royal	Hayes' Lily du Preel (imp.).	Murwillumbah	10 Nov., '12.
,,	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes	Berry Farm	*
Ayrshire	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm	*
,,	Jamie's Ayr	Jamie of Oakbank	Miss Prim	Wollongbar Farm.	*
,,	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose	H.A. College, Richmond	*
,,	Julius Cæsar	Auchenbrain Spicy Jock (imp.)	Julia	Grafton Farm	*
Kerry	Kildare II	Kildare (imp.)	Belvedere Bratha 3rd (imp.).	H.A. College, Richmond	*
,,	Bratha's Boy	Aicme Chin (imp.)	Bratha 4th	,, ,,	*
,,	Rising Sun	Bratha's Boy	Dawn	Bathurst Farm	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Berrigan A. and H. Society	T. E. Crowther...	Oct. 4
Adelong P. and A. Association...	A. W. Molineaux	,, 10, 11
Pooncaira P. and A. Society	N. McLeod and F. J. Windsor	,, 11
Hillston P. and A. Association	S. I. Gordon ...	,, 19
Lismore A. and I. Society	T. M. Hewitt ...	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd ...	,, 8, 9

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh..	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser ...	,, 17, 18
Kiama A. Association	R. Somerville ...	,, 26, 27
Wollongong A., H., and I. Association	M. A. O'Donnell ...	Feb. 1, 2, 3
Berry A. Association	C. W. Osborne ...	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson ...	,, 13, 14
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson ...	,, 20, 21, 22
Central Cumberland A. and H. Society (Dural) ...	H. A. Best ...	,, 23, 24
Quirindi District P., A., and H. Association ...	G. Fowler	,, 27, 28, 29
Inverell P. and A. Association	J. McIlveen ...	,, 28–Mar. 2
Hawkesbury District A. Association (Windsor) ...	H. S. Johnson ...	,, 29
		Mar. 1, 2
Dapto A. and H. Society	J. H. Lindsay ..	,, 1, 2
Bangalow A. and I. Society	W. H. Reading ...	,, 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin..	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel ...	,, 6, 7
Warialda P. and A. Association	A. J. Devine ...	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy ...	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge ...	,, 7, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest ...	,, 12, 13, 14
Campbelltown A. Society	F. Sheather ...	,, 13, 14
Cobargo A., P., and H. Society	T. Kennelly ...	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 13, 14, 15
Bowraville A. Association	C. Moseley ...	,, 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy ...	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts ..	,, 14, 15, 16
Gundagai P. and A. Society	A. Elworthy ...	,, 19, 20
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson...	,, 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly ...	,, 21, 22, 23
Moree P. and A. Society..	D. E. Kirkby ...	,, 23, 24, 25
Molong P. and A. Association	W. J. Windred ...	,, 27
Cooma P. and A. Association	C. J. Walmsley ...	,, 27, 28
Yass P. and A. Association	W. Thomson ..	,, 27, 28
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd ...	,, 28, 29, 30
Bathurst A., H., and P. Association	A. H. Newsham ...	April 17, 18, 19
Richmond River A., H.. and P. Society (Casino) ...	D. S. Gayner ...	,, 23, 24, 25
Dungog A. and H. Association	C. E Grant ...	May 1, 2.
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 8, 9, 10
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	Aug. 20, 21, 22
Corowa P., A., and H. Society	J. D. Fraser ...	,, 27, 28

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Agricultural Gazette of New South Wales.

Field Experiments with Wheat.

Conducted under the direction of GEO. L. SUTTON, late Wheat Experimentalist.

IV.—A MANURIAL TRIAL.

Object.—To determine the effect upon the yield of wheat of the application of simple and mixed fertilisers when applied at the same time that the wheat is planted, *i.e.*, directly with the wheat crop, and to soil in which the fertility and the supply of organic matter are maintained by a suitable rotation. Incidentally, the results will show the character of the fertiliser required for the best results, and also the advisability or otherwise of applying the fertiliser to the rotative crop instead of to the wheat crop.

The following fertilisers singly, and in combination, are compared with each other, and also with the results obtained from land that receives no manure when the wheat crop is planted:—Dried blood, sulphate of potash, and superphosphate. A mixture of dried blood, superphosphate, and sulphate of potash is also compared with a mixture of sulphate of ammonia, superphosphate, and sulphate of potash, to determine whether the organic form of nitrogen supplied in the dried blood is equal to or better than the nitrogen supplied in the sulphate of ammonia.

The quantity of nitrogen, phosphoric acid, and potash added to the plots receiving such is the same in each case, these plant-foods being applied at the following rates per acre:—

	lb.
Nitrogen (N)	12·42
Phosphoric acid (P_2O_5)	15·0
Potash (K_2O)	15·6

The amount of the various fertilisers applied per acre are easily computed from their analyses. Sketch A shows the fertilisers applied to the wheat crop.

In order to even up the plots so that the effect of a fertiliser applied directly to the wheat crop may be observed, complementary manures are applied to the renovating crop, in such a way, that each plot will receive a dressing of the same kind and quantity of complete fertiliser during the course of the rotation. Sketch B shows the fertilisers applied to the renovating crops.

The yields from eight plots manured at the time the wheat is planted, with simple and mixed fertilisers, are compared with the yields obtained from five check plots, which receive no manure when the wheat is planted.

The differences due to the various fertilisers applied to the plots are not estimated by comparing the yields of the plots one with another, but by comparing the differences which exist between the actual yields of the plots and the yields which it is estimated these plots would have produced had they been planted as check plots. This estimated yield will be based upon the assumption that the differences between neighbouring check plots are due to regular and similar variations in the soil between them. The natural yield of any plot will, therefore, be intermediate between those of its two check plots, and proportionate to its distance from them.

The plots are arranged so that the first, and then every succeeding third plot, is a check plot.

Except in regard to the amount and character of the fertilisers applied to the different plots, the whole block is treated uniformly. The plots are prepared and planted as nearly simultaneously as the weather will permit.

WHEAT MANURIAL TRIAL, COWRA EXPERIMENT FARM, 1910.

F. DITZELL, Experimentalist.

THIS experiment has been carried out in accordance with the above general directions governing it at this and the other experiment farms.

The rotation adopted in connection with this experiment is a two-course one, in which wheat alternates with a renovating crop. Two blocks of land are, therefore, required. Those reserved are two portions of H VI.

Previous History of Block.

The dates of clearing and breaking-up, and subsequent cropping of Block H were given in October *Gazette*, when dealing with Experiment III.

Preparation of the Ground.

This was the same as described in October *Gazette* under Experiment III.

Planting.

This experiment was planted on the 27th of May, with Bunyip wheat.

The rate of seeding was about 42 lb. per acre.

To prevent the occurrence of bunt (stinking smut) in the ensuing crop, the seed was treated with bluestone, 2 per cent., and salt, 2 per cent.

The fertilisers were applied evenly and uniformly over the plots in accordance with the plan of the experiment. Sketch A shows the fertilisers applied

to the wheat crop. It will be noticed that the check plots are unmanured. The fertilisers were sown through the fertiliser box of an ordinary grain drill, and were previously mixed up with dry sand to such a bulk (found by actual trial) as would allow all the fertilisers to be sown by the same speed rate of the fertiliser distributor, namely, 160 lb. of manure per acre.

The plots were 16 links wide, which is 3·2 links greater than the space occupied by the plants in the plot. The plants in the portion of any plot harvested for comparison are, therefore, sufficiently far from the plants of another plot receiving different treatment to give reliable results, *i.e.*, the results are not rendered unreliable by diffusion of manures.

Harvesting.

Before harvesting the plots were reduced to one-tenth of an acre each in area by cutting off the ends. The whole of each plot was then harvested for grain with a stripper and winnower on the 17th of December, and from these areas harvested the computed yields per acre have been worked out.

The grain was weighed as it left the winnower, and the weights recorded are therefore those of a farmer's sample.

The Character of the Season.

Particulars of rainfall, &c., were given in June *Gazette*, page 484.

Results.

The results are given in the following table. As these results are from one year's experiment only, it is impossible to draw any definite conclusions from them, and any deductions made must be strictly regarded as being tentative only.

The fertilisers applied to the various plots, arranged in their order of merit, are as follow :—

1. Superphosphate.
2. Dried blood.
3. Sulphate of potash.
4. Dried blood and superphosphate.
5. Sulphate of ammonia, superphosphate, and sulphate of potash.
6. Superphosphate and sulphate of potash.
7. Dried blood, superphosphate, and sulphate of potash.
8. Unmanured.
9. Dried blood and sulphate of potash.

These fertilisers are arranged in order of merit in accordance with their "percentage" yield. The terms "natural" and "percentage" yields were fully explained by Mr. Sutton in the last February *Gazette*, under "Tillage Experiments with the Plough," page 167.

Experiment IV.

Manurial Trial with Wheat, Cowra Experiment Farm, 1910

Sketch A.

Showing fertilisers applied to the wheat crop.

15.	Division.	
14.	Unmanured	(*Check plot.*)
13.	Sulphate of ammonia .. Superphosphate .. .. Sulphate of potash	lb. 61 87 30
12.	Dried blood .. .. .. Superphosphate .. .. Sulphate of potash	106 87 30
11.	Unmanured	(*Check plot.*)
10.	Superphosphate .. .. Sulphate of potash	87 30
9.	Dried blood . .. .. Sulphate of potash	106 30
8.	Unmanured	(*Check plot.*)
7.	Dried blood .. .. .. Superphosphate	106 87
6.	Sulphate of potash	30
5.	Unmanured	(*Check plot.*)
4.	Superphosphate	87
3.	Dried blood	106
2.	Unmanured	(*Check plot.*)
1.	Division.	

Sketch B.

Showing fertilisers to be applied to renovating crop.

15.	Division.	
14.	Dried blood .. . . Superphosphate .. . . Sulphate of potash	lb. 106 87 30
13.	Nil.	
12.	Nil.	
11.	Dried blood .. .. Superphosphate .. .. Sulphate of potash	106 87 30
10.	Dried blood	106
9.	Superphosphate	87
8.	Dried blood .. .. Superphosphate .. .. Sulphate of potash	106 87 30
7.	Sulphate of potash	30
6.	Dried blood .. .. Superphosphate	106 87
5.	Dried blood .. .. Superphosphate .. .. Sulphate of potash	106 87 30
4.	Dried blood .. .. Sulphate of potash	106 30
3.	Superphosphate .. .. Sulphate of potash	87 30
2.	Dried blood .. .. Superphosphate .. . . Sulphate of potash	106 87 30
1.	Division.	

Each plot is 16 links wide and 875 links long, and has therefore an area of ·14 acres. The total area occupied by the experiment is ·14 acres × 15 (Plots) = 2·1 acres.

WHEAT MANURIAL TRIAL, COWRA EXPERIMENT FARM, 1910.

TABLE showing the effects that the different fertilisers have upon the yield of wheat.

Variety—Bunyip; date planted, 27th May, 1910; date harvested, 17th December, 1910.

Plot No.	Fertiliser.	Computed yield per acre.	Natural yield per acre.	Percentage yield.
		bushels.	bushels.	
1	Division	....	....	....
2	Unmanured ... ... (*Check plot*)	33·16	33·16	100·00
3	Dried blood	36·16	34·22	105·66
4	Superphosphate	37·50	35·27	106·32
5	Unmanured ... ... (*Check plot*)	36·33	36·33	100·00
6	Sulphate of potash	37·50	36·16	103·70
7	Dried blood and superphosphate	37·33	36·00	103·69
8	Unmanured ... ... (*Check plot*)	35·83	35·83	100·00
9	Dried blood and sulphate of potash.	32·00	35·33	90·57
10	Superphosphate and sulphate of potash	35·50	34·83	101·92
11	Unmanured ... ... (*Check plot*)	34·33	34·33	100·00
12	Dried blood, superphosphate, and sulphate of potash ...	35·00	34·55	101·30
13	Sulphate of ammonia, superphosphate, and sulphate of potash.	36·00	34·78	103·50
14	Unmanured ... ... (*Check plot*)	35·00	35·00	100·00
15	Division	....	....	....

WHEAT MANURIAL TRIAL, WAGGA EXPERIMENT FARM, 1910.

R. W. McDIARMID, Experimentalist.

THE object of this experiment, and the general arrangements for carrying it out, have been explained above. The arrangement of the plots at Wagga Farm is shown in Plan C.

The following manures, singly and in combination, are being tested:—Sulphate of ammonia, sulphate of potash, and superphosphate. Organic nitrogen is also being compared with sulphate of ammonia, in order to ascertain which will give the better results.

Fertilisers used are applied at such rates that the following amounts of plant-food per acre are added with each :—

	lb.
Phosphoric acid	15
Potash	15
Nitrogen	12·42

The following plan shows the arrangement of the plots :—

Plan C. WHEAT Manurial Trial, Wagga Experiment Farm, 1910.

	BUFFER.		
1	No manure.		(*Check.*)
		lb.	
2	Sulphate of ammonia	61	
3	Superphosphate	88	
4	No manure.		(*Check.*)
5	Sulphate of potash	30	
6	Sulphate of ammonia ... ... Superphosphate	61 88	
7	No manure.		(*Check.*)
8	Sulphate of ammonia ... ... Sulphate of potash	61 30	
9	Sulphate of potash .. .. Superphosphate	30 88	
10	No manure.		(*Check.*)
11	Sulphate of ammonia ... ... Sulphate of potash ... ... Superphosphate	61 30 88	
12	Blood ... ... Sulphate of potash ... ... Superphosphate	105 30 88	
13	No manure.		(*Check.*)
	BUFFER.		

Plots each one round of drill, 10 chains long.

Treatment during Rotation.

During the rotation each plot will be treated separately, and fertiliser applied to each in such a way that each plot will receive a dressing of complete manure (*i.e.*, one containing nitrogen, potash, and phosphoric acid) during the course of the rotation. Plots that receive no manure when the wheat is grown, receive a complete fertiliser when the rotation crop is sown.

The following table gives the hay and grain results obtained the first year :—

TABLE showing result of Wheat Experiment IV, Wagga Experiment Farm, 1910.

Variety—Bunyip; rate of seeding, 30 lb. per acre; date sown, 10th May, 1910; area of plots harvested, ·122375 acre.

Plot.	Manure.	Manure per acre.	Hay.									Grain.				
			Date.			Weight.		Percentage of loss in drying.	Yield.			Date ripe.	Yield.			
			Flowered	Harvested.	Weighed.	Green.	Dry.		Per Acre.	Natural.	Per-centage.		Plot	Per Acre	Natural.	Per-centage.
		lb.	1910.	1910.	1910.	c. qr. lb.	c. qr. lb.		t. c. qr. lb.	t. c. qr. lb		1910.	lb.	bushels.	bushels.	
1	No manure	..	1 Oct.	19 Oct.	16 Nov.	6 1 0	2 1 24	60·5	1 0 0 15	1 0 0 15	100	17 Nov.	118	16·07	16·07	100
2	Sulphate of ammonia ..	61	30 Sept.	19 ,,	16 ,,	5 2 8	2 1 14	57	0 19 1 18	0 19 3 19	97·35	17 ,,	115	15·67	16·34	95·9
3	Superphosphate	88	26 ,,	12 ,,	3 ,,	8 0 8	3 1 8	59	1 7 0 16	0 19 2 22	137·81	13 ,,	172	23·43	16·61	141·06
4	No manure	..	1 Oct.	19 ,,	16 ,,	5 1 0	2 1 15	55	0 19 1 26	0 19 1 26	100	17 ,,	124	16 88	16·88	100
5	Sulphate of potash .	30	30 Sept.	19 ,,	16 ,,	5 0 20	2 0 9	60	0 17 0 0	0 18 0 11	93·93	16 ,,	133	18·12	16·65	108 8
6	Sulphate of ammonia .. Superphosphate	61 88	26 ,,	12 ,,	3 ,,	7 2 14	3 0 24	58	1 6 1 2	0 16 2 23	157 24	13 ,,	167	22·75	16·43	138 46
7	No manure	..	1 Oct.	19 ,,	16 ,,	4 2 6	1 3 14	59	0 15 1 8	0 15 1 8	100	16 ,,	119	16·2	16·2	100
8	Sulphate of ammonia .. Sulphate of potash ..	61 30	30 Sept.	19 ,,	16 ,,	4 2 6	1 3 21	58	0 15 3 9	0 15 0 6	105·16	16 ,,	120	16·35	15·07	108·49
9	Superphosphate .. . Sulphate of potash ..	88 30	26 ,,	12 ,,	3 ,,	7 2 14	2 3 27	61	1 4 1 21	0 14 3 4	165·28	13 ,,	147	20·02	13·93	143·72
10	No manure	..	1 Oct.	20 ,,	16 ,,	4 1 0	1 3 3	58	0 14 2 2	0 14 2 2	100	17 ,,	94	12 8	12·8	100
11	Sulphate of ammonia .. Sulphate of potash .. Superphosphate	61 30 88	26 Sept.	13 ,,	3 ,,	8 3 2	3 2 9	59	1 9 1 1	0 15 3 23	183·38	13 ,,	175	23·83	13·98	170·46
12	Blood .. .. .. Sulphate of potash .. Superphosphate	105 30 88	26 ,,	13 ,,	3 ,,	9 0 0	3 1 14	63	1 7 2 9	0 17 1 15	158 65	14 ,,	181	24·65	15·17	162·49
13	No manure	..	1 Oct.	19 ,,	16 ,,	5 1 22	2 1 6	58	0 18 3 8	0 18 3 8	100	17 ,,	120	16·35	16·35	100

The grain yields of this Experiment were interfered with by birds—particularly so in Plots 1, 2, and 3,

From the table it will be readily seen that better results as regards both hay and grain are obtained by manuring. The hay yields are not heavy, considering the amount of manure applied, but the comparisons between the manured and unmanured crops are valuable. Bunyip is not a suitable variety for hay in this district, as will be seen from Experiment I, where it was lowest on the list in the mid-season planted section.

The value of superphosphate is just as evident in the grain yields as in the hay yields. The addition of nitrogen and potash increased the yields, but not sufficiently to warrant the extra expense in using same.

WHEAT MANURIAL TRIAL, BATHURST EXPERIMENT FARM, 1910.

R. G. DOWNING, Acting Experimentalist.

THIS experiment was carried out in accordance with the general directions explained above. The results at Bathurst Farm were as follow:—

Manure.	Plot Yield.	Acre Yield.	Natural Yield.	Percentage Yield.
	lb.	bushels.	bushels.	
Unmanured ... ... (*Check.*)	174	21·8	21·8	100
Blood (106 lb.)	186	23·3	21·3	109·4
Superphosphate (87 lb.)	193	24·2	20·86	116·0
Unmanured ... . (*Check.*)	163	20·4	20·4	100
Sulphate of potash (30 lb.)	180	22·5	20·3	110·8
Blood (106 lb.), superphosphate (87 lb.)	192	24·5	20·2	121·2
Unmanured ... ... (*Check.*)	161	20·1	20·1	100
Blood (106 lb.), sulphate of potash (30 lb.)	166	20·8	19·8	105·0
Superphosphate (87 lb.), sulphate of potash (30 lb.) ...	161	20·1	19·5	103·0
Unmanured ... ... (*Check.*)	153	19·1	19·1	100
Blood (106 lb.), superphosphate (87 lb.), sulphate of potash (30 lb.)	155	19·4	19·33	100·5
Sulphate of ammonia (61 lb.), superphosphate (87 lb.), sulphate of potash (30 lb.)	159	19·9	19·56	101·7
Unmanured ... ... (*Check.*)	158	19·8	19·8	100

These results are published for general information, but no deductions should be drawn as regards the experiment until the results of several years' trials, including the complementary manuring of the rotation crops, are available.

Weeds in Wheat Fields.

MARK H. REYNOLDS, Inspector of Agriculture.

INCLUDED in the many benefits of fallowing land and a system of crop rotation is the rapid elimination of weeds. Many wheat fields this season, where wheat has followed wheat, or where wheat has been sown in land that had not been cultivated the previous season, but left in stubble, and become covered with weeds and grasses, are now standing examples of the faultiness of such treatment. In some instances the weeds hold a commanding position.

At Cumnock, this spring, the following weeds were found in profusion in one wheat field. (For the naming of a number of these plants I am indebted to Mr. J. H. Maiden):—

Rumex obtusifolius, dock; *Rumex acetosa*, sorrel; *Hordeum pratense*, barley grass or foxtail; *Erodium cicutarium*, heron's bill; *Trifolium* vars. trefoils; *Lepidium ruderale*, cress; *Papaver hybridum*, wild poppy; *Geranium dissectum*, crane's bill; *Anagallis arvensis*, pimpernel; *Polygonum aviculare*, hogweed; *Capsella bursa-pastoris*, shepherd's purse; *Centaurea* vars., cock spur, Saucy Jack; *Lithospernum arvense*, corn gromwell, white weed; *Sinapis* var., mustard; *Avena fatua*, black oats.

In addition to these fifteen specimens, there were occasional plants of other varieties.

It will be noticed that the trefoils are included in the list. This has been done advisedly, because over a considerable area of country the whole of the available moisture in the land is required for the main crop—in this case wheat. It is well known that trefoils and clovers are very valuable plants, in that they are a medium by which atmospheric nitrogen is made available as plant-food, and they also produce, when rotted, very desirable humus; but they are out of place occupying the land at the same time as the main crop—wheat—in our somewhat dry areas. This season, throughout the western wheat division, large areas sown to wheat are thickly covered with mustard, hogweed, white-weed or white-flower (or, as some farmers call it, take-all), barley grass, iron weed, and black oats, star, black, or variegated thistles. Any one of these tend to seriously diminish the yield, or are a hindrance at harvesting time. In the moister and cooler districts, especially on the red loams, sorrel is very prevalent.

The most favourable time for each of the nineteen weeds mentioned to germinate, vegetate, and seed is similar to wheat, oats, and barley. Concerning wheat, the whole of them have produced seed before the wheat grain is ready to cut for threshing or to strip.

It is obvious, therefore, that by only breaking the land in the autumn and shortly after sowing the wheat, the land will not be rid of these weeds. The yearly encroachment on to fresh fields is evidence of this. That such weed-infested ground will keep farmers poor, who persist in slipshod methods, is apparent. Further, the value of the land for cultivation purposes is reduced as much as £2 per acre where certain weeds take control. Due to the gradual, and in some districts rapid, advance in the price of agricultural lands, this reduced value does not show; but certain it is that the area where weeds are kept in check is quite worth the extra £2 per acre.

There is no surer index that the cultivation area has been cropped year in and out with wheat for grain, or if the area has been spelled one season, that no lengthened period of cultivation has been given, than the presence of one or more of these weeds in profusion in wheat areas. Of course, feeding chaff containing black oats or weed seeds to the working horses would contaminate the cleanest field, and a farmer would be very foolish who would do such a thing.

Criticism is distasteful at all times, but our eyes should be open to the seriousness of weed infection of our lands. In the favoured rainfall areas, wheat follows wheat each year, often for six to ten years, the limitation being due to the land becoming wheat-sick or too weedy. There is a practice of cutting headlands and spaces for fire-breaks for hay throughout wheat areas. This is a necessity, and sufficient hay is often obtained in this way to carry on until next harvest.

Methods to Reduce Weed Infection.

If farmers in addition would grow, on a different area each year, quick maturing wheats such as Firbank, Florence, or Steinwedel, by sowing early and cutting when in flower, the land could be cultivated before a number of the weeds mentioned had matured. This hay could be stored as a reserve for lean years. Where bare fallowing is part of the system of farming, weeds will seldom be a serious consideration. Where rotation of crops is included in the system the same can be said. If the rotation includes early autumn sowing of rape or other crops that vegetate in the winter and early spring, see that the remnant is ploughed under about mid-October, before any of the weeds whose growing period approximate wheat produce seed. If summer crops are grown, such as maize and sorghum, let the land be cultivated the last time when there is no further fear of a large addition of the beforementioned winter weeds. To attain this object, the sowing time for these summer crops could start from 1st October; and for one reason amongst others, the maize, sorghum, &c., are best sown in drills, enabling the spaces being cultivated and freed from weeds.

Some Notes on Farming Problems in the North-west.

A. H. E. McDONALD, Inspector of Agriculture.

THE north-western wheat districts differ materially from those of any other part of the State. The chief centres are Quirindi, Curlewis, Gunnedah, Boggabri, Narrabri, Gravesend, Warialda, Delungra, Inverell, Tamworth, Manilla, and Barraba. The conditions vary somewhat in the different districts, both in soil and climate; but, roughly, two main groups may be made. The first and largest group embraces Tamworth, Manilla, Barraba, Quirindi, Curlewis, Gunnedah, Boggabri, and Narrabri. The second group includes Delungra and Inverell.

At Gravesend and Warialda, the conditions are somewhat different to those of either of these groups. A fair amount of farming is done in both centres, and, in the near future, a considerable increase will probably be made, especially towards Moree. A large area of very fine wheat country lies along the railway in that direction, and it is surprising that the extension of the line should not have been the means of bringing more of it under the plough.

In the Quirindi district, farming is followed with excellent results, but a good deal of the country is too rugged to be brought under cultivation. Further, a considerable area is locked up in large estates, and development is materially hindered. It is very probable, however, that much of this land will be released in the near future, when, agriculturally, the district will become of greater importance. The rainfall is rather more favourable than in most of the other districts in the group in which it is placed. Much of the soil is also different, being of a deep black nature, somewhat similar to a good deal of the Inverell country. Taking it altogether, this centre must be included in the Tamworth group.

North-western Soils.

In this group the land under cultivation is principally a strong red clay loam. Some rich alluvial flats are found, but the areas are not great. Around Tamworth itself a large area of black soil occurs, but this has not yet been farmed to any extent. Neither has it yet been found profitable to cultivate the extensive black soil plain country of the north-west.

The soil in the Inverell district, on the other hand, is a strong black loam, with patches of lighter red loam. The black soil is very rich, and apparently owing to its high content of lime, crumbles on the surface and retains a natural mulch, which checks the loss of moisture considerably. It is extremely sticky when wet, and is somewhat expensive to work. In the

summer months it is inclined to crack badly, but the rainfall is high and fairly constant, so that crops do not suffer unduly from drought. The red soil is fairly easy to work, but sets hard in dry weather. Couch grass and other weeds spread fairly rapidly through this soil.

In each district minor differences occur in places. For instance, at Boggabri and Gunnedah, patches of country are found where there is a greater admixture of sand with the clay, and the soil is, consequently, easier to work, and retains moisture to a greater extent. The character of the country is, in many instances, indicated by the flora. The presence of pine trees is an almost infallible sign that the soil is either sandy or a sandy loam.

Taking the Tamworth district as a whole, however, the soil may be classed as a strong clay loam. It differs from most other wheat lands of the State in being very strong and rich. When the rainfall is favourable, good crops are still obtained from paddocks that have been under cultivation for over forty years.

The predominating character of tenacity is due to the presence of a large proportion of fine clay. The clay particles bind together, and as the soil dries, this causes it to set into a hard mass very difficult to break up, making the working of the soil an expensive matter. In many cases, up to eight horses have to be used in four-furrow ploughs. Small teams are sometimes used, but generally, when such is the case, thorough ploughing cannot be given.

It often happens with this stiff land that it cannot be got in order in time to allow the seed to be sown at the most favourable season. In some cases this is the fault of the land, and in others the fault of the working, or, rather, the lack of it. The north-western land does not lend itself to broad farming. The best results are obtained by the man who crops a comparatively small area. He generally has the equipment and time to prepare the land thoroughly at the right time. Where large areas are held, the temptation is to get as much wheat in as possible, and as the success of the crop depends very largely upon the preparation of the land, the highest yields are not obtained.

The Rainfall.

The rainfall of the north-west is very different to that of any other portion of the State. The yearly average in the farming districts is from 23 to 30 inches, which is much above that of most of the inland districts. Its most distinguishing feature, however, is the period of its fall. The greatest quantity is registered during the summer months, whilst in the southern and western districts the bulk of the rain is recorded in the colder months, or what may be more clearly designated as the wheat season. In the north-west the wettest months are December, January, February, and March. The highest monthly average is that of February. The heaviest floods occur in these months.

The average rainfall in the winter months, when the wheat crop is growing, is lighter than in districts in the southern portion of the State with corresponding or even considerably less annual averages. This places the

latter districts in a more favourable position as far as the wheat-grower is concerned, as the crop receives a larger proportion of the annual rain. Against this, however, the north-west enjoys other compensating advantages. The chart prepared by Mr. H. C. L. Anderson, and published in the July issue of the *Agricultural Gazette*, shows graphically the remarkable difference between the rainfalls of the north-west and south.

North-west Problems.

In the north-west, through much of the rain falling in the summer months, important modifications of farming practices have to be made. The rainfall and soil determine very largely farming methods, and as these are essentially different to those of the old-established farming districts, men coming from them are forced to modify their methods considerably. The problems have been faced and conquered to some extent, but there is very much to be learned yet before farming methods in the north-west arrive at perfection. Some of the problems are:—

What is the influence of the summer rains upon the succeeding wheat crop under the farming methods at present in vogue?

What would its influence be were methods followed which would lead to the conservation of some of the moisture in the soil?

What is its influence upon the soil?

What methods are to be adopted to secure its conservation in the soil?

What is the effect of the rain upon weed growth?

What influence has the peculiar character of the rainfall upon the crop, including its growth, health, and quality of the grain?

Which are the best crops or varieties of crops to grow?

The influence of the soil upon the crop has also to be considered. In fact, the influence of the soil and the rainfall are so intermingled that it is somewhat difficult to separate the one from the other. The natural fertility of the soil is so great that excessive rain has a more marked effect upon the crop than in those localities where the soil is of a poorer nature. We thus frequently find a heavy, coarse growth of leaf and straw in the north-west, which is prejudicial to the success of a grain crop.

Before considering these questions in detail, we may assert that the special characters of the rainfall and soil are responsible for problems in the north-west which are not found elsewhere, or at least do not obtrude themselves to the same serious degree.

The Influence of the Summer Rain upon the Succeeding Crop.

It is not too much to assert that under the methods which are almost universally followed in the north-west, the summer rainfall is of practically no benefit to the following wheat crop, that is, in so far as supplying moisture to it is concerned.

The heaviest rainfall is recorded in January and February, while sometimes fair falls occur in March. Rains credited to March, however, often fall in

the early part of the month. April and May, on the other hand, are comparatively dry months. Instances can be given, of course, to show that good rains fall in these months, but the averages show that, as a rule, the rainfall is short; and in practice it is by no means infrequently found that it does not suffice to germinate the seed. During the present year the conditions of the sowing season have been most unfavourable to proper germination. Since the middle of February only light rains have fallen, and rain coming on a dry seed-bed has only served to moisten the surface. Much of the seed has sprouted, but plants have withered away, and in some cases resowing has had to be done, while many paddocks only carry a thin crop. These crops are all late, and, unless the season is exceptional, cannot be expected to give a first-class yield.

The exception proves the rule, and thus we find in the present year splendid crops growing on some farms, although just beyond the fence in adjoining properties the wheat is backward and unpromising. It would look as though one paddock had received 2 or 3 inches of rain which, through some mysterious cause, had not extended beyond the fence. When inquiries are made it is found that a system of cultivation has been pursued with the object of storing the summer rainfall, so that it will be available for the succeeding crop. Since we can see how valuable this moisture is, and how desirable it is that it should be saved, we wish to know by what means we can achieve the end. Since the present methods fail to secure its benefits to the crop, the cause of the loss must be sought. Happily, investigators have discovered what it is, and determined a means of preventing it.

The Effect of Summer Rains upon the Soil.

The heavy summer rain in beating down upon the land melts away the clods and aggregated particles and runs the fine clay grains together. The crumbly nature of the soil is destroyed and it becomes compact. A crust forms on the surface, and everything is favourable to the rapid loss of moisture. If man deliberately set out to produce a condition in the soil conducive to the evaporation of its contained moisture, he could not do better than nature does with its heavy rains. The moisture is then able to rise rapidly to the surface, and under the intense heat of the sun evaporation takes place, and the faster it proceeds and the greater the amount of moisture removed, the harder the soil becomes. The unfavourable condition into which these soils set is markedly illustrated in the greater horse-power which is required to plough the land. Instead of being friable, it is close and dense, and offers considerable resistance to the plough. When it is ploughed large clods are made, which tend to keep the ground open and in such a state that moisture is lost rather readily, but if these clods are reduced to a too fine condition subsequent rains may set the soil again.

The Moisture-holding Capacity of the Soil.

The value of a particular farm or district for crop production depends almost entirely upon the nature of the soil and rainfall. The influence of

each is so intermingled that one cannot be separated from the other. Th fertility of land, by which is meant its power of producing crops, does not depend solely upon the amount of plant-food it contains; no amount of chemical fertilisers, for example, will make a barren clay produce maximum crops. As a matter of fact, fertility depends more upon the capacity of the soil for retaining a desirable amount of moisture. Even poor sandy soil will give good crops when just the right amount of rain for that particular soil falls at regular periods. In a dry climate, where long intervals may occur between the falls, moisture-holding capacity is of the utmost importance. Some soils are so superior to others in this respect that as good or better crops can be obtained from them with a rainfall of some inches less during the growing period of the crop.

Roughly, the moisture-holding capacity is determined by the percentages of sand, clay, and humus. The quantities of the first two are practically unalterable, but the last is susceptible to many influences. When careless methods of farming are followed, it very quickly disappears. Humus is of far greater importance to soil fertility than is generally realised; but unfortunately, it is only after it has disappeared, and the soil shows the effect of its depletion, that its value is appreciated.

In the north-west the conditions are extremely favourable to the destruction of humus. Being an unstable organic substance, it is subject to changes, and in these changes it loses its character and no longer exerts a beneficial influence upon the soil. The changes are wrought by bacteria which resolve it ultimately into gases, which pass away, and into earthy particles similar to the ash left after a plant is burnt with fire. These bacteria require certain conditions to bring them into activity. Amongst these, moisture and warmth are the most important, and without one or both the bacteria can work little change in the humus. Since in the north-west heavy rains provide the moisture in the warm months of the year, the conditions are especially favourable to their operation, and an enormous destruction of humus must take place.

Many north-western farmers have remarked that the soil does not seem to hold the moisture as well as it once did—that it is harder to plough, and that it breaks up into great clods which are not easy to reduce. These men argue, not from theory, but from actual observation. They see the effect, but do not realise the cause. Most of the land which is to-day under the plough was not so very long ago carrying more or less green timber. The greatest portion of the wheat land of the north-west was cleared of the virgin forest not more than twenty years ago, and in most cases the forest was fairly dense. During the centuries that this forest was in existence, the leaves and bark were gently falling to the earth and incorporating themselves with it, becoming, in fact, an integral part of the soil. This rich dark mould kept the land friable, and, because of its sponge-like character, also retained the moisture.

The loss of humus is not confined to cleared and ploughed land, however, although there it occurs most rapidly, owing to the specially favourable

conditions obtaining. It is proceeding wherever the land has been denuded of its timber, whether by ringbarking or clearing, and, consequently, virgin land of the present is not in all cases equal to the virgin land of some few years ago. Then the land put under the plough had not long been cleared of the green timber; now it is many years since it was killed by ringbarking.

In view of the naturally tenacious character of this north-western land, the depletion of one of the most important substances tending to keep it in a friable condition is most serious. If it goes on at the present rate, and no attempts are made at prevention, the land of the north-west will be in a very sorry state in a few years. It is a problem which is only just beginning to assert itself; farmers are only commencing to realise that all is not as it should be. It is a comparatively easy matter to bring about exhaustion of this most valuable ingredient, but it is a much more difficult and expensive task to restore it. The soils are rapidly becoming more difficult to work; what they will be like in a few years, if present practices are persisted in, can only be a subject of conjecture.

We can reiterate, therefore, that one of the first essentials in the improvement of this land is that provision be made to retain a good percentage of organic material in the soil. In all arid climates its presence has a most important influence upon the soil fertility, and its reckless destruction can end in nothing but disaster.

The Conservation of Humus.

Since this material has so important an influence upon the fertility of the soil, and is so readily decomposed by the processes going on in the soil, and, at the same time, since Nature's method of restoration is no longer in operation, resort must be made to some artificial means. While so little is known by farmers of the importance of humus, it seems scarcely possible to say too much in an effort to draw attention to the necessity of conserving, or rather renewing, the supply. Under the methods of cultivation in practice, the loss must go on, and when more elaborate methods come to be adopted, with the object of conserving soil moisture by mechanical means, the loss must be still greater.

A little consideration of Nature's methods indicates the necessity of adopting artificial means when these are no longer in force. The trees growing on the land rain down their leaves and bark annually; grass grows and dies; roots thrive for a time and then decay. Nature's bank, so to speak, is returning a splendid rate of interest to the soil each year. But when the settler's axe and matchbox come along, this great capital goes up in smoke and is lost.

How, when crops are grown, is the supply to be kept up? Two courses seem to be open to the farmer; and it is by adopting one of these, or, better still, a combination of both, that the desired object is to be attained. Firstly, the stubble may be turned under; and, secondly, crops may be grown with a view of increasing the humus content of the soil.

By reason of the special nature of the rainfall in the north-west, the farmer is in a more favourable position to deal with the stubble than is the southern farmer. Either can deal with his stubble easily when the land is cropped with wheat only in alternate years. The farmer in the north-west, however, with his rich ground, is not yet adopting, and is not likely, for a time at least, to adopt such a practice. Whilst the land is free from weeds, he prefers to crop every year, and although an ideal may be set up, it can only be reached by gradual stages; and it would be unwise to give no consideration to existing conditions in the pursuit of an ideal. The presence of weeds such as black oats compels a rest at times; but apart from this, it is as yet difficult to say whether, if summer fallowing combined with turning under the stubble is followed, continuous cropping will not be more successful than a rotative method. Certainly at present, few practical farmers are prepared to relinquish continuous cropping whilst the land is clean.

Just as certain, however, is the fact that exhaustion of humus is creating a most undesirable condition in the soil, and that a remedy at some time or other will have to be adopted. The man who will feel the pinch the least will be he who takes steps to apply the remedy early. Knowledge is required of how far towards maintaining the supply the stubble will go, and what crops are to be grown to supplement it.

The turning under of stubble in some cases presents considerable difficulty, owing to its bulk. Generally, however, it can be accomplished by means of the disc plough. The ploughing must be done very soon after harvest, so that the stubble will have thoroughly decayed before the time for sowing the next crop. Usually sufficient moisture will be available through the summer rains for the process of fermentation which causes the decay, and it will be found that after a few weeks the straw has thoroughly incorporated itself with the soil.

The natural herbage that often grows so prolifically on cultivated land can often be turned to good account as green manure. If a system of rotation is practised, the supply of humus can be maintained by turning under stubble and natural herbage.

Further, crops such as cowpeas may be grown, and after being fed-off by sheep, the remains turned under to enrich the soil. Cowpeas are great drought-resisters, and should give good crops in the North-western districts. They grow during the summer, and the rainfall, therefore, suits them.

Conservation of the Summer Rainfall.

Apart altogether from any effect which the presence of a large quantity of moisture must have upon the soil constituents, and the resultant effect of these upon the growth of the crop, it cannot be doubted that, were the moisture which is precipitated upon the earth during the summer months conserved, a most beneficial effect would be exerted upon the crop.

As before indicated, the heaviest records are found in the summer months. The months of April and May, the seeding months, are generally dry, and often so dry that the soil cannot be prepared for the crop in time. Land has

to be left out or sown late, and it is well known that on the average the late crops yield much less than the early sown crops.

The amount of moisture which can be conserved depends so much upon the character of the soil, temperatures, &c., that any set of figures cannot be made to apply in every case. Judging from the effect produced upon the crop in a dry year by the adoption of proper cultural methods, it can scarcely be overstating the case to say that the conserved moisture would be equivalent to 2 or 3 inches of rain. To one who is accustomed to viewing only the immediate effect upon the surface soil, of a 2 or 3 inch fall, this will probably appear a gross exaggeration. It must be remembered, however, that any moisture existing to a depth of as much as 4 feet in the soil, can be looked upon as largely effective, as it tends always to rise to the surface. Another point is, that soils always hold a percentage of moisture which they will not give up to plants. In the case of clay soils this percentage is high. Further, although soil will not part with this moisture to plants, it is drawn from it by the heat and winds of summer. This means that when rain comes, the soil's demand for its normal quantity of moisture must be satisfied before the needs of plants. Therefore, if the soil has been kept somewhat moist the rain that does fall is all available, whereas otherwise only a portion is so.

Judgment of the condition of the soil is generally passed upon the first few inches—the part that can be scraped away by the hand. It must be remembered, however, that there is a great depth of subsoil below the surface capable of absorbing water, and if this is already well filled, then a fall of an inch or two of rain will be of vastly more benefit to a crop. The value of a fall of rain on the wheat is determined, not so much by the number of inches as by the quantity already in the ground. If a fair amount is conserved in the soil, 1 inch may be as useful as 3 inches would otherwise be. In judging the effects of cultivation, therefore, the apparent conditions as evidenced by the surface of the soil should not be considered, but the actual condition as shown by a thorough examination of the subsoil. This explains the reason why crops grown on well cultivated land are usually superior to those grown where only poor cultivation has been given; although at seeding time the surface soil is in each case apparently similar.

Methods of Cultivation.

The north-west lends itself admirably to summer fallow. Viewed from one standpoint the conservation of soil moisture is simplified because of the fact that heavy rains occur comparatively shortly before seeding. It is not necessary to conserve the moisture through long summer months; the falls in January, February, and March, after harvest, are usually ample. But although, as far as time is concerned, the falls are opportune, the conservation of the moisture is not the simple matter it seems. This is owing to the torrential nature of the rainfall, and the clayey character of the land. Saturation has the effect of breaking up the more or less large particles into fine separate grains, which fit together more closely, destroying the openness of the soil. From being open and friable, it becomes very compact. This is a condition very unfavourable to the retention of moisture.

Soil moisture, it may be explained, passes away into the air from the surface, and it must rise before it can be evaporated. If very rich land is closely examined when it has dried after having been saturated, a thin layer of whitish salty material may be found at the top. This substance has been in solution in the soil moisture, and has been drawn to the surface with it; but in the course of evaporation has been left behind. If salty water be evaporated, the salt will be found remaining in the same way.

The rise of moisture is hastened by compactness of the surface soil. When it is loose and broken, capillarity is destroyed, and the moisture cannot rise readily.

How, then, is the farmer to work his land so that he will prevent the loss of moisture and conserve it for his crops? It is a problem which, owing to the peculiar nature of the soil and rainfall of the north-west, is very difficult to solve. Different methods to those followed in the other main wheat districts, or, rather, modifications of them, are required. The problem is complicated by the circumstance that an excessive growth of weeds is encouraged by the summer rainfall, and fostered by those very cultural processes which are required in the conservation of moisture. This, and the fact that fine cultivated land is very liable to set and become intensely hard constitute the chief difficulties.

In many cases the problem has been given up, and preparation of the land is only made immediately before sowing the seed. In other cases the land is ploughed early and is reploughed before sowing. Occasionally, three ploughings may be given, but it is very exceptional to find anywhere that any other implement is used in the preliminary preparation.

Ploughing.

In any system the plough must of course play a prominent part. The "most important part" was almost said, but the various operations so dovetail with each other, and each is so necessary, that it is difficult to say which is the most important. Good ploughing is very essential; but many men often plough far more than is necessary.

It may seem strange to some to condemn ploughing, but nevertheless too much ploughing may have a detrimental effect upon the soil, through causing a loss of moisture. For instance, if firm, moist, friable soil is turned up with the plough, it is opened and loosened, air circulates through it very freely, and the contained moisture is dried out. If a second ploughing is imperative through the growth of weeds, it should not be deeper than is necessary to bring about their destruction.

A good first ploughing is required, and ought to be given as soon as possible after harvest. Land with a large percentage of clay in its composition should be ploughed fairly deeply, so that it will absorb readily any rain that falls. Shallowly ploughed soil will not absorb heavy rains fast enough, and the surface consequently runs together. This most undesirable condition is to be strictly guarded against; but unless prompt means are adopted immediately after heavy summer falls, it is almost sure to be produced.

Special care is required in selecting the plough. Where a mould-board can be used it is probably the best type. It is specially advantageous, because it does not break the soil up so finely as a disc plough. This only applies, however, when the land is in such a condition that it crumbles up under the plough. Since most of the land is in a more or less hard state when ploughed, it is not likely to be made too fine, no matter what class of plough is employed. Where the land is covered with weeds and rubbish, it is only by using the disc plough that the work can be done at all.

Ploughing is only preliminary work, and its primary purpose is to put the land in such a condition that moisture will readily percolate into the subsoil. If it is not ploughed, or is only ploughed to a shallow depth, water cannot soak in readily, and much of it runs away over the surface. The less moisture the land contains the less freely rains soak in; and as under the heat of summer the north-western land parches to a great degree, it is very necessary that it should be made loose to a good depth.

Whilst the ground is dry after ploughing, no advantage whatever is gained by harrowing or cultivating it. It is rather an advantage to have it cloddy, as it resists the washing, separating effect of the rain to a greater extent, and the soil does not go together so compactly.

Cultivation.

As before mentioned, ploughing is only the first operation in the process of conserving the moisture. Immediately rain falls on ploughed ground it washes it together and makes it firm, with a crust on the surface. Such a state is very favourable to rise of the moisture to the surface, and its dissipation into the atmosphere. From the clay ground of the north-west, with its high temperatures, such a loss takes place very rapidly unless means of prevention are adopted. The most effective means is the breaking of the crust to a depth of 2 or 3 inches, so that a loose layer of earth is left on the surface. This is a non-conductor of moisture, and consequently hinders evaporation. Its effectiveness depends upon its looseness; and since the crust is again formed by the rain, the loose-earth layer has to be renewed. A rapid means of cultivating is therefore required, so that the land can be worked after every heavy fall.

What implements are to be used? In addition to covering the ground quickly the implement must not leave the land too fine, otherwise it may go into a very undesirable condition. On heavy clay land the disc cultivators cannot be favoured; they leave the ground too fine and flat. What is required is a cultivator which will stir the land to a depth of 2 or 3 inches, and at the same time leave it fairly rough. The spring-tooth cultivators do good work, but are not very suitable, as the tines break somewhat easily in stony or stumpy land. A good stump-jump cultivator seems to be the most desirable kind of implement. Such an implement should be fitted with tines fairly wide, so that all weeds will be destroyed. Almost any implement will destroy weeds when they are just sprouting, but

it is not always possible to get at them at that time, and one is required which will deal with them when they are firmly rooted.

In seasons when several heavy falls of rain follow each other in rapid succession, as in the early part of the present year, it is probable that good results would be obtained were the cultivation left until after the last rain; but since it is impossible to predict this, the only safe course is to commence to work the land immediately after every fall. The heavy clay soils of the north-west set very quickly after they have been saturated, whether they have been worked or not. Ploughed ground left in the rough may not set so hard as unploughed land. One thing is certain—if the land is worked after rain, even if only to a depth of a few inches, with a cultivator, it will not set as it will if this is not done. Further, much moisture will be held, which will ensure good germination, and keep the crop growing healthily during periods of drought. Fortunately, the more advanced farmers are beginning to realise the value of good cultivation, and in the present season a few crops can be seen which are far ahead of the majority, solely through such cultivation having been given.

Excessive Growth of Crops to be Checked.

The luxuriant growth of north-western wheat, induced by the fertility of the soil and a good rainfall, often has to be checked. The better the cultural methods followed the more necessary it becomes. When land is prepared early and the summer rains are conserved by cultivation, the favourable condition of the soil induces a rapid growth of the early-sown crops. No other means of checking this equal to feeding-off with sheep has been discovered.

The feeding-off must be done in a rational manner. In itself it has no intrinsic merit, and is only advantageous when at a certain time of the year the crop is forward and promises to grow too strongly or to ear too early. As a general rule, if the crop is too forward in June it should be fed-off.

Besides feeding-off at the right time, great care has to be exercised in the north-west in selecting a time when the land is in suitable condition. Always naturally inclined to set, it may be trampled into a very hard condition if sheep are put on it whilst it is damp. Partly because of this, and partly because constant nibbling is bad for the crop, the greatest benefit will be obtained from feeding-off when it is done rapidly by putting on a large number of sheep in fine weather.

In the north-west, it is quite possible that where sheep can always be secured when required for checking the crop, even earlier sowing than is at present practised would be advantageous. In the first three months of the year, the rainfall is, as a rule, heavy, but in April and May it is generally light; and not infrequently it happens, as in the present year, that much of the seed is not up before the end of June. By a proper system of summer fallow, it has been demonstrated that it is possible to conserve sufficient of the summer rains to germinate the seed, and maintain a healthy growth through a dry autumn. Early sowing is advisable under such circumstances, as more moisture is available for germination, and the plants get a good

root-hold before the surface dries too much. Sheep must be available however, otherwise, should the crop advance too quickly, the growth cannot be retarded.

The feeding-off must be done before the crop has grown too much. If stems have been formed, the fullest benefit will not be secured from the feeding-off. It is easy to tell when a crop is likely to be too forward, and the feeding-off should be done before the plants commence to form stems. It is preferable to do this and then to feed-off again a second time if necessary, rather than to allow the crop to become too forward.

The Lodging of Wheat Crops.

Despite all precautions, however, it frequently happens in the north-west that the crop grows too strongly. From the grain-grower's point of view this is very undesirable, since it often leads to loss in various ways. If the ground is softened by rain under a heavy crop, and strong winds occur, the almost inevitable result is that the crop lodges. It may partially recover, but in nearly all cases there is some loss. If it goes down early—*i.e.*, just about earing time, or soon after—not a great amount of harm may follow; but if rain and wind come together when the crop is approaching maturity, it is almost certain that a very large proportion of the grain will be lost. In such circumstances the straw does not rise again, and the harvester comb is unable to reach the grain.

This trouble is accentuated when low, rich flats are cropped. In wet seasons the soil in such places promotes an enormous growth, and a farmer is fortunate if he is able to save all his grain.

Various methods of preventing or lessening the loss may be adopted. The best is that of growing only those varieties which are inherently so constituted that they will not lodge. This may be through the straw being short, or sufficiently strong to stand the stress of weather. Some varieties, such as Gluyas' Early, whilst being very suitable in other respects, have to be discarded on account of their exceptionally weak straw. Federation is a wheat which stands well owing to its straw being both short and strong. Short-stemmed varieties are less likely to lodge than the taller sorts. Varieties should be selected which have been proved not likely to lodge.

Lodging could generally be largely prevented if the nature of the season could be accurately forecasted. Since this cannot be done, reasonable precautions must be taken to avoid it. Since rank crops are in danger of lodging, means must be adopted to check excessive growth. The crop may be sown late on land likely to produce such a condition; but, on account of other reasons, this is often not advisable, except in districts where favourable seasons are assured. Early-sown crops are most liable to grow rankly, but, on the average, they give the highest yield, so it is not always wise to delay sowing.

The advantages of early sowing may be secured, and its dangers avoided, by the expedient of feeding-off, should it be necessary. When the crops are sown early a splendid root-growth is made, which enables them to get a rapid

start in the spring, and so derive the utmost benefit from the moisture left by the winter rains. At the same time, it may encourage a good deal of leaf growth. If the crops are sown early, the weather is propitious, and a fair amount of growth is made before the end of June, more or less lodging will probably occur unless the crop is fed-off. By following this practice, however, in a rational manner, lodging can be prevented.

Rank growth, besides being conducive to lodging, may be responsible for a diminished yield through the grain shrivelling or not forming. An enormous amount of moisture passes through even a normal plant in the course of a day, and this is materially greater when the plant is large and sappy. It has been abundantly proved that the yield of grain is not in direct ratio to the amount of stem and leaf. In fact, one variety, Federation, seems to show that it may be in inverse ratio—that is, the less the steam and leaf, within certain limits, the greater the yield of grain. The wheat crops, especially those of the north-west, are frequently subjected tc dry spells, and the crop which is rank and heavy suffers more during these than those that are reasonably well grown, simply because the heavy crop demands more moisture, and therefore suffers more acutely, because it exhausts the available supply more rapidly.

The Influence of the Climate in the Development of Rust.

Rust is an enemy of wheat with which the farmer of the north-west has to contend always. It is present more or less every year. In some seasons the disease develops to an enormous extent and causes widespread loss, but fortunately this happens rarely. Again, some situations are more liable to it than others.

The nature of this disease is fairly well understood. Certain conditions favour it, and since these are known, it is possible to predict in which paddock or portion of a paddock it will be most prevalent. Since it develops, however, only under certain weather conditions, it is impossible to forecast whether it will ravage the crops or not. The spores are blown about by the wind, and are probably present every season, but it is only when the atmospheric conditions are favourable that the disease manifests itself seriously.

The critical period is about the earing stage, or, rather, at the time of year when earing generally takes place. The temperature must rise to a certain point before rust spores will develop, and it is at this time that the temperatures reach that point. Further, a moist atmosphere is required. Neither warmth nor moisture singly will develop the disease. Therefore, we may reasonably expect that if the atmosphere remains moist for any length of time, and is at the same time warm, rust will develop in the crop. In low-lying situations these conditions are more frequently found than at higher levels, and consequently rust is often found in such places when it is absent from crops grown on the higher land. A further predisposing cause of rust in the crops is rank growth. Such soft, sappy crops are more easily attacked than those with harder, firmer straw.

The different varieties of wheat show very marked degrees of susceptibility to the ravages of rust. Some kinds are extremely rust-liable, whilst others offer very strong resistance to it. A variety may not be attacked, either owing to some physiological cause which renders it immune, or it may escape through being early and consequently so far advanced towards maturity when the conditions suitable to rust occur, that it is not in a favourable state for the attack of the disease.

The crops in the north-west are rather more susceptible to rust than those of other portions of the State. Probably this is owing to the latitude and the rainfall. The temperature rises earlier in the season, and during the critical period of growth the atmosphere is usually moister than in other parts of the State. This renders it necessary, amongst other things, for the farmer to take those precautions which minimise the risk of rust attacking the crop.

Effect of the Climate upon the Quality of the Grain.

The showery weather which often occurs in the north-west at harvest time is somewhat detrimental to the quality of the grain. This may appear a bold statement to make, considering the high quality of north-western flour, and the fact that the chief prizes at the Sydney Royal Agricultural Society's Show are usually won by north-western wheats. This merely illustrates, however, how a natural drawback may be overcome by thinking men. The showers at harvest time certainly bleach and soften the grain of many varieties, but by the selection of those sorts which have been so designed by the breeder that they are not affected by weather conditions, this danger is avoided.

The statement has been made time and again that north-western wheat is soft in character, and this to a certain extent holds true. It is, however, only some varieties that bleach, and it is, as a rule, these which find their way into the outside markets. The north-western millers have learnt that certain kinds retain their hardness and colour, and consequently these are secured by them, and their quality is known principally only through the excellence of the flour.

The most notable example of these is Comeback. This variety has year after year proved itself a splendid wheat by its uniformly superior quality. In every season its grain is harvested in prime condition. On the other hand, some varieties do undoubtedly bleach, and the farmer must be keen to select those which are not susceptible to the weather.

Summary.

It can be said in recapitulation that the north-western farmer has to guard against too exuberant growth, against rust, and against bleaching of the grain. While cultural methods and adventitious aids, such as feeding-off, may to an extent prevent some of these dangers, past experience indicates that the greatest degree of success will be achieved by careful selection of those varieties which have the particular characteristics which render them

immune to attack. An ideal variety would combine all the qualities mentioned, together with high yielding capacity. It is doubtful if any of the wheats available at the present time exactly fulfil all the requirements, although varieties like Comeback approach the standard very nearly. With the success achieved in the past as an encouragement, however, it should not be long before the ideal wheat is obtained.

Meanwhile the farmer in the north-west has to exercise exceptional care in selecting his varieties, as it is not merely a question of which will give the best yield, but which will, over a series of years, be most suitable for his purpose. The man who merely requires a wheat that will resist drought, has comparatively little difficulty in making his choice, but the seasons vary so much in the north-west that only the wheat which is good under all circumstances will give perfect satisfaction.

Such, then, are some of the problems which the north-western farmer has to face. They are due chiefly to the strong nature of the soil and to the heavy rainfall, especially during the summer months. Whilst this means extra expense and labour in working the soil, the farmer has his compensation in the fact that if proper precautions be taken to conserve the humus, he has a practically inexhaustible soil, while the splendid rainfall enables him to use his land to the best advantage.

In these notes attention has been devoted solely to wheat growing, but in the north-west other crops can be and are successfully grown. At present the determining factor in farming operations is the soil, and those crops are grown, or those industries followed, for which the soil is naturally and pre-eminently fitted. For instance, we find that on the deep rich land of the Inverell district lucerne and maize are extensively grown, and dairying is an important industry; while we find that on the red loams of comparatively shallow depth wheat is almost exclusively grown. The tendency seems to have been to grow those crops which naturally do well upon the particular class of land occurring on the farm. Thus where there are large areas of diverse soils, mixed farming is carried on with great success.

We have no more marked example of this than the Inverell district, and it is probable that nowhere within the bounds of the State can a more fertile district be found, nor one which is better adapted for successful mixed farming in the truest sense of the term. With an average rainfall of over 30 inches, and rich soil of all classes, almost every imaginable crop and fruit can be grown to perfection. Thousands of acres of lucerne are grown, the maize and wheat paddocks are measured by the mile, dairying is extensively followed, pig-raising is conducted with profit; and fairer orchards, where oranges thrive by the side of cherry trees, and peaches, apricots, pears, and grapes do equally well, could not be conceived.

All this, however, is merely due to Nature's prodigal gifts. Right through the north-west, conditions are favourable to mixed farming. In some places the conditions are not ideal for the growth of some crops, as maize, for example; but they are so near it that, given some assistance by man's brains, these crops can be grown successfully.

Perhaps the greatest problem of all is how the land is to be worked so that the best use will be made of Nature's gifts. They are too good to be wasted; and in the light of what has been achieved by cultivation under far more adverse conditions, it is but little to expect that ultimately the best means of utilising them will come into general adoption. The presence of weeds such as wild oats, is rendering somewhat unprofitable the cultivation of wheat in some of the paddocks, and another crop is required to allow of a rotation. Observation leads to the opinion that when the knowledge of how to cultivate the land thoroughly is firmly imbued, wheat will not be the only crop that will be grown on the rich acres of the north-west, but that maize and perhaps other crops will wave in the summer breezes with it.

A further special advantage which the heavy summer rainfall confers upon the north-western farmer is the increased stock-carrying capacity it gives his land. During the summer months there is generally an abundance of feed, and in the mild winter months there is a luxuriant growth of herbage.

All these things tend to a splendid system of mixed farming. No other portion of the State of equal extent seems to be so well fitted to respond to the efforts of man intelligently directed. It is really, as a district, suited for the comparatively small farmer—for the man who can keep his work well in hand. Whilst large areas under wheat have proved profitable, the general tendency, where the holdings are extensive, is towards grazing pursuits chiefly. This is because of the difficulty of supervising the working of large areas, and of getting the work done at the right time. The man who holds a small farm is in a position to pay closer attention to his work, and obtains the greatest profit from his land. The north-west is not understood properly yet, and, in consequence, a splendid heritage is lying practically undeveloped.

Coast Locusts in the West.

The Large Mottled Locust (*Locusta australis*, Brunner) is common in the coastal districts of New South Wales and Queensland, where it is found in pairs in long grass in open forest country. It is 2½ inches from the front of the head to the tip of the closed wings, and 3½ inches across the outspread wings, and of a general brown colour. The fore-wings are very finely mottled with darker brown, but the hind ones are not clouded, being uniformly light brown.

Some specimens of grasshoppers recently sent from Quambone Station, to the west of Coonamble, were identified by Mr. W. W. Froggatt, Government Entomologist, as *Locusta australis*. They were reported to be doing great damage to vegetables, orange-trees, flowers, and rose-bushes. Mr. Froggatt recommended the following remedies:—

Poisoning with Paris green and bran is the simplest method of getting rid of these pests—1 lb. of Paris green to 16 lb. of bran, made up (after being well mixed dry) into a bran mash with water to which some salt has been added. This is placed about on the ground in patches among the infested plants, and the grasshoppers readily eat it.

In seasons such as last autumn when everything was green, this might not be so effective. Under such conditions, the foliage of the plants or bushes most frequented by the grasshoppers should be sprayed inside and out with Paris green, which will kill them in a few days.

Insectivorous Birds of New South Wales.

[Continued from page 843.]

23. Magpie.

PROCEEDING with the insectivorous birds commonly met in the open, we come to the Magpie. The most widespread species is the black-backed, shown in the plate. The white-backed Magpie (*Gymnorhina leuconota*) is found in the southern portion of the State, but the one illustrated is freely distributed throughout Queensland, New South Wales, Victoria, and South Australia.

Many readers will hardly agree with our inclusion of the "Maggie" amongst the list of farmers' friends, as these birds have been known to do considerable damage to crops by eating seed after sowing, or pulling up young wheat or oat plants. There has been a good deal of controversy about the matter. Mr. Hall suggests that a field-glass be directed at a parent bird with a nest of young, when her mouth will be seen to be full of insects for distribution to the youngsters. Mr. Campbell recommends that a bird be placed in a cage and fed upon grain diet, when it will soon die. A still more convincing proof can be obtained by merely watching the birds in the paddocks during the grasshopper season. After seeing the havoc which they work upon this plague of the drier districts, one will not be inclined to grudge them the little grain which they consume.

Poisoned baits laid for crows are often responsible for considerable destruction to Magpies, which are real meat-eaters. When tamed they will greedily devour any scraps of meat thrown to them, and they often develop the habit of stealing food from the table. A little consideration should induce anyone to admit that the useful work done by the Magpie in suppressing insect pests far exceeds any damage which it may do to crops.

The song of the Magpie is another of the early morning sounds of the bush, which haunt us when we are compelled to remain in the cities. It is a pleasing warble, resembling an irregular flute melody, and is given by a chorus of the birds before leaving their nests. But in the breeding season the Magpie has another cry, a short, high-sounding "quark, quark," with which it greets any person or animal approaching the nest. The male bird works himself into a violent passion, and will fiercely attack the intruder with its strong beak. The consequence is that the Magpie, though looked upon as a necessary element of bush life, is not so popular with schoolboys as the Jackass, and an odd stone from a catapult is hurled at him as he picks his way across an open field. The death of a good insect-eater is not always regretted by the boy who has had his ears picked as he unconsciously passed a Magpie's nest.

The nest is bowl-shaped, measuring a fooc or upwards in diameter externally by 6 inches in depth. It is built of stick sand twigs, but very often small pieces of wire are woven into the structure. Inside it is lined with grass, wool, or other soft material. As many as five eggs have been recorded in one nest, but usually three or four are laid.

The young Magpies remain with their parents until full grown, and only leave them then when forcibly driven away.

24. Pee-wee.

The Australian Magpie is in no way related to his namesake of England; but early settlers, noticing the external resemblance of the two birds, gave the old English name to ours. In the same way the next bird illustrated was named the "Pee-wit" after an English bird, and the name has been corrupted to "Pee-wee." In this series we are endeavouring to give the birds the names by which they are most commonly known throughout the State. The cry of this species also more nearly resembles "Pee-wee" than "Pee-wit." The names "Magpie-Lark" and "Mud-Lark" are also used, but are not nearly so common.

Dr. N. A. Cobb, late Pathologist of this Department, called attention to the great value of these birds in destroying snails, the hosts of sheep-fluke. The Pee-wee also frequents ploughed lands and orchards in search of grubs, worms, and other insects. Most of its time is spent on the ground in search of insects, and its flight is somewhat clumsy and ungraceful. Stomachs of birds examined have always contained insects, and no charge of interfering with grain or fruit has ever been made against them.

The Pee-wee prefers the vicinity of water, and is most commonly found along the margins of rivers and creeks; in fact its shrill cry is associated with water of some sort. The nest is built of pellets of mud mixed with grass, and lined with dried grass or feathers. It is placed near the extremity of a limb, generally on a gum-tree on a river bank, and is a conspicuous object.

The following remarks are taken from Mr. North's "Nests and Eggs of Birds found Breeding in Australia":—

Pastoralists, sugar-planters, farmers, and orchardists, to whom this bird renders such valuable services, should assist in affording it absolute protection, by preventing thoughtless boys and pot-hunters from trespassing on their lands in search of "something to kill," not only in the close season but all the year round. The ever-trusting and fearless disposition of this bird should in itself be a sufficient claim to the protection it undoubtedly deserves; but, unfortunately, the easy manner in which it may be approached is too often the cause of many of them falling easy victims to misplaced confidence in man.

INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"MAGPIE."

Gymnorhina tibicen, Lath.

Second Annual Report of the Demonstration Area, Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

I HAVE pleasure in submitting the Second Annual Report of the Demonstration Area at this Farm. A profit is again shown, namely, £1 3s. 3d. per acre. This, though not as large as that for 1910, which was £1 8s. 8d. per acre (see amended statement in Appendix), is, notwithstanding, satisfactory, considering the many disadvantages under which the work has been carried out. These disadvantages have been set out in my first report.

In my opinion, the greatest value of this report lies in the data obtained respecting the cost of various operations and the returns obtainable from certain products. The cost of operations is in excess of what the farmer can perform them for; yet he will be able to put his own value upon them, and this may lead him to analyse his own operations with a view of reducing the cost of production.

Throughout the year wages were increased from 7s. to 8s. per day. The expenditure of pulling wild oats from paddocks No. 5 and part of No. 2 needs some explanation, and was a legacy from past manurial and cultural experiments, when wheat was grown continuously for several years. By such practice the oats could not be kept in check, and last season appeared to favour their growth, as throughout the State it was termed a "wild oat" season. As the crops were required for seed, the expenditure was incurred.

The rainfall for the year was 22·47 inches. Notwithstanding this, the season must be classed as a comparatively bad one. The distribution was decidedly faulty; 713 points fell in January and 254 points in December, leaving only 1,280 points for the intervening ten months.

The average yield for the area under wheat was 26 bushels 20 lb. per acre. This was considerably reduced by unseasonable frosts, Bunyip suffering most in this respect. The choice of Bunyip was certainly a mistake. A tabulated statement of the treatment and yields is given.

The average yield of hay was 1 ton 7 cwt. per acre. This average cannot be compared with the average for grain, as the grain areas had the pride of place, whereas the hay was grown directly after either wheat or maize,

excepting that portion reaped from headlands. This growing of hay after wheat or maize is one of those legitimate risks which may be taken occasionally, but should not be followed extensively. Hay is cut earlier than the grain crop, and is not so injuriously affected by a dry early summer.

It will be seen from the returns from the fodder crops that these have been grown at a loss throughout the year. This is in no small measure due to the very unfavourable autumn, winter, and early spring, but also to their being ploughed under earlier than during the previous year, and the very low basis upon which the returns from the sheep are based. The benefit of the crop residues, the cleansing from weeds, and the ability to plough at seasonable times, cannot be estimated in £ s. d.

The weights per cubic foot of both hay and straw are interesting, and are valuable as a basis when such are sold as stacks. The account sales of both hay and straw are given, and should help beginners to value their produce either in stack or on rail, or to gauge them by Sydney prices.

It will be seen that in the cultural operations the plough plays an important part, the land generally being ploughed thoroughly 6 inches deep once a year, and afterwards economically skim-ploughed twice to kill weeds and prepare a seed-bed. No compression whatever was carried out. The wheat was drilled across the furrows of the last ploughing.

A statement of the average cost of the operations for wheat-growing is given; also the returns based upon the average yield per acre at milling rates. The expenses are unavoidably greatly in excess of those throughout the typical New South Wales wheat belt. The statement is given simply, for more easy reference.

An adjusted statement of the profits for 1910 is given, as that report was based upon several estimates which were eventually exceeded. This year's report has the advantage of being based upon actual returns.

As regards the paddocks under maize, it was impossible to give an actual statement for the 1909 crop, but it has been made out in full for this report. Half the profits are credited to 1909 and the other half to 1910. A statement of the 1910 crop is given in full, as returns were available. Half the profits are credited to the year 1910, and the other half will be carried over to 1911.

The following are detailed statements of expenditure and receipts, together with other particulars:—

Demonstration Area, Bathurst Experiment Farm, 1910-11.

STATEMENT of Treatment, Yields, &c., of Crops.

Paddock No.	Area.	Variety.	Previous Crop.	Treatment.	Seed per Acre.	Date Sown.	Manure per Acre.	Date Harvested.	Yield per Acre.	Remarks.
	acres.				lb.					
1	14·32	Bobs wheat for hay.	Wheat for grain	Ploughed 5 inches, 16/4/1910.	27	16/4/1910	60 lb. superphosphate	3/11/1910	1 t. 10 c. 3 qr.	....
1A	7·19	Bunyip wheat..	Fodder crop (rape and barley).	Ploughed 6 inches, 3/11/1909; skim-ploughed, 19/2/1910; ploughed 4 inches, 19/4/1910.	25·08	2/5/1910	31 lb. superphosphate	8/12/1910	18 bus. 56 lb.	Yield reduced by frost. Headlands cut for hay.
Part of No. 2	18·16	Federation wheat.	Fodder crop (rape and rye)	Ploughed 6 inches, 30/10/1909; skim-ploughed, 4 inches; 22/3/1910; skim-ploughed 4 inches, 24/4/1910.	26·8	27/4/1910	12·19 lb. superphosphate	19/12/1910	29 bus. 33 lb.	Manure only applied to poorer portion of paddock at rate of 30 lb. Yield reduced by frost on low ground.
Part of No. 2	12·81	Riley's Favourite maize.	Bare fallow ..	Ploughed 4 inches, 19/2/1909; ploughed 6 inches, 28/9/1909; cultivated, 15/10/1909	3·82	21/10/1909	59 lb. superphosphate	31/5/1910	31 bus. 51 lb.	Wheat sown for hay directly after maize was harvested.
Part of No. 2	12 81	John Brown wheat for hay	Maize	Ploughed 6 inches, 11/6/1910.	49·9	14/6/1910	59 lb. superphosphate	18/11/1910	1 ton 2 cwt.	....
2A	15·36	Cleveland wheat.	Fodder crop (rape and barley).	Ploughed 6 inches, 15/11/1909; skim-ploughed, 5/3/1910: skim-ploughed, 4 inches, 8/4/1910.	25·9	13/4/1910	25½ lb. superphosphate	19/12/1910	28 bus. 19 lb.	Manure applied only to lighter hill land at about 30 lb. per acre.
5	10·39	Bayah wheat ..	Part bare fallow, part fodder crop (rape and rye).	Ploughed 6 inches, 7/11/1909; ploughed, 6 inches, 1/3/1910; skim-ploughed, 4 inches, 27/4/1910.	29·5	29/4/1910	....	17/12/1910	22 bus. 28 lb.	Low ground affected by frost.
6	24·9	Fodder crop (Cape barley and rape).	Part wheat for hay and part barley for grain.	Ploughed 4 inches, 4/2/1910.	16·34 barley; 3·37 rape.	....	31·91 lb. superphosphate	....	Carried 2·5 sheep per acre for 5 months.	Rape and barley sown in alternate drills on 19·28 acres.
10	10·2	Riley's Favourite maize.	Lucerne ..	Ploughed 7 inches, 21/6/1910; skim-ploughed, 4/10/1910, cultivated, 11/11/1910 and 29/12/1910.	5·1	8/10/1910	27·8 lb. superphosphate	.. ..	Whilst under lucerne carried 2·1 sheep per acre for 5 months	A portion of this paddock has been added to No. 12. Fences were rearranged in 1910. This paddock was under lucerne before breaking up for maize.
11	31·32	Fodder crop (rape and barley).	Wheat	Ploughed 4 inches, 22/3/1910.	17·8 barley; 3·06 rape.	23/3/1910	63·4 lb. superphosphate	....	Carried 1·84 sheep per acre for 5 months.	....
12	28·24	Fodder crop (rape and barley).	Wheat	Ploughed 4 inches, 25/2/1910.	15 barley; 2·76 rape.	1/3/1910	51·5 lb. superphosphate	....	Carried 2·07 sheep per acre for 5 months	....

Paddock No. 1—Bobs Wheat.

Area, 14·32 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	4	16	0	Agistment	7	11	6
Seed, 6½ bushels, Bobs wheat	1	19	0	22 tons 1 cwt. chaff, at £4 2s. 11d. per ton	91	8	3
Manure, 7¾ cwt. superphosphate	1	13	8½				
Drilling	1	6	10				
Cutting hay	1	14	9				
Twine, 46¾ lb.	0	19	6				
Stooking...	1	7	6				
Carting straw for stack ...	0	11	3				
Cutting thistles...	0	0	7½				
Carting hay to stack	4	3	9½				
Straw for thatching stack ...	0	5	0				
Thatching stack	1	6	5				
Twine, 2½ lb.	0	1	0½				
Cutting chaff, at 11s. per ton...	11	0	6				
Chaff bags, 546 at 3·7d. each...	8	8	4				
Cartage of chaff to rail... ...	0	17	6				
Loading chaff on trucks ...	0	3	0				
Rent, 14·32 acres	5	19	4				
Balance, being net profit ...	52	5	8				
	£98	19	9		£98	19	9

Paddock No. 1a—Bunyip Wheat.

Area, 7·19 acres.

Dr.	£	s.	d.	*Cr.*				£	s.	d.
First ploughing...	2	6	5	Agistment				1	8	11
Second „	0	16	7	99 bus. 55 lb. wheat, at 6s.	29	19	6			
Third „	1	14	0½	3 bus. wheat, at 3s.	0	9	0			
Seed, 3 bushels, Bunyip wheat	0	18	0	3 bus. 50 lb. wheat, at 2s.	0	7	8			
Treatment for bunt	0	0	10½					30	16	2
Manure, 2 cwt. superphosphate	0	8	8	5 t. 3 c. 2 qr. 20 lb. straw, at £1 17s. per ton				9	11	7
Drilling	0	11	0	9 c. 2 qr. 20 lb. hay, at £3 3s. 1d. per ton				1	10	6
Removing stray plants ...	2	2	0							
Cutting headlands for hay ...	0	3	9							
Twine, 1½ lb.	0	0	7½							
Stooking...	0	3	3							
Carting hay to stack	0	5	1½							
Cutting wheat	0	15	1							
Twine, 18¾ lb.	0	7	10							
Stooking...	0	6	3½							
Restooking	0	1	6½							
Carting and stacking wheat ...	1	9	11½							
Digging drain around stack ...	0	0	6							
Threshing	2	14	8							
Carting to barn	0	4	0							
Recleaning and grading ...	1	6	2½							
Bags, 34 at 5d.	0	14	2							
Covering straw stack	0	1	0							
Pressing straw, at 11s. per ton	2	16	11							
Cartage and loading of straw...	0	11	3							
Cartage of wheat to rail ...	0	4	2							
Rent, 7·19 acres	2	19	11							
Balance, being net profit ...	19	3	4							
	£43	7	2					£43	7	2

Part of Paddock No. 2—Federation Wheat.

Area, 18·16 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
First ploughing...	4	10	4½	Agistment	1	13	0
Second ,, ...	3	0	11	464 bus. 20 lb. wheat, at 6s. 139 6 0			
Third ,, ...	2	15	11	31 bus. 18 lb. wheat, at 3s. 4 13 11			
Seed, 8 bushels Federation seed wheat	2	9	4	6 bus. 10 lb. wheat, at 2s. ... 0 12 4			
Treatment for bunt	0	0	10½		144	12	3
Manure, 2 cwt. superphosphate	0	8	8½	12 t. 3 c. 2 qr. 12 lb. straw, at £1 17s. per ton	22	9	5
Drilling	1	6	0	1 t. 9 c. 1 qr. 16 lb. hay, at £3 3s. 1d. per ton	4	12	8
Removing stray plants... ...	5	1	9½				
Cutting headlands for hay ...	0	2	3				
Twine, 4½ lb.	0	1	10½				
Stooking hay	0	1	0½				
Carting hay to stack	0	4	3½				
Cutting wheat for grain ...	2	3	6½				
Twine, 42½ lb.	0	17	8½				
Stooking	1	0	5				
Restooking	0	1	6½				
Carting to stack	5	5	7½				
Covering stack	0	2	0				
Digging drain around stack ...	0	0	6				
Threshing	12	16	11				
Carting wheat to barn... ...	0	10	4½				
Recleaning and grading ...	6	9	9				
Bags	3	7	6				
Covering straw stack	0	2	6				
Pressing straw, at 11s. per ton	6	13	11				
Carting straw to station ...	0	19	10				
Loading straw on trucks ...	0	6	0				
Cartage of wheat to rail ...	0	19	4				
Rent, 18·16 acres	7	11	4				
Balance, being net profit ...	103	15	2				
	£173	7	4		£173	7	4

Part of Paddock No. 2—John Brown Wheat.

Area, 12·81 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	3	13	4½	Agistment	1	18	2
Seed, 10½ bushels wheat ...	3	3	0	14 t. 2 c. chaff, at £4 2s. 11d. per ton	58	9	1
Manure, 6⅔ cwt. superphosphate	1	9	4				
Drilling	1	3	5				
Cutting hay	1	6	6				
Twine, 39 lb.	0	16	3				
Stooking...	0	8	11½				
Carting hay to stack	2	6	4				
Straw for thatching stack ...	0	8	0				
Carting straw for thatching ...	0	5	4½				
Thatching stack	1	2	8				
Digging drain round stack ...	0	0	6				
Cutting chaff at 10s. per ton ...	7	1	0				
Chaff bags, 450 at 3·7d. each...	6	18	9				
Carting chaff	0	14	0				
Rent, 12·18 acres	2	13	4½				
Balance, being net profit ...	26	16	5				
	£60	7	3		£60	7	3

Part of Paddock No. 2—Riley's Favourite Maize.

Area, 12·81 acres.

Dr.				£	s.	d.
Expenses as per previous report				15	4	10
Additional expenditure—						
2nd cultivation				2	10	3
3rd do				1	3	10
Seed maize—						
Pulling and carting	2	7	4			
Hand threshing ...	4	7	10			
Bags	0	3	10			
				6	19	0
Bulk maize—						
Pulling and carting	6	2	4½			
Machine threshing	4	8	2½			
Bags	2	2	5			
				12	13	0
Rent, 12·81 acres for six months				2	13	4½
Balance, being net profit ...				27	15	8½
				£69	0	0

Half net profit for 1910, £13 17s. 10d.

Cr.	£	s.	d.
34 bushels seed maize at 7s. 6d. per bushel	12	15	0
375 bushels bulk maize at 3s. per bushel	56	5	0
	£69	0	0

Paddock No. 2a—Cleveland Wheat.

Area, 15·36 acres.

Dr.	£	s.	d.
First ploughing...	5	10	10
Cultivating portion	0	4	4
Second ploughing (portion only)	1	17	7
Third ,, ...	2	1	4
Seed, 6 bus. 38 lb. Cleveland wheat	1	19	10
Treatment for bunt	0	3	10½
Manure, 3½ cwt. superphosphate	0	15	2½
Drilling	1	9	7½
Removing stray plants ...	4	13	3½
Cutting headlands for hay ...	0	3	9
Twine, 4½ lb.	0	1	10½
Stooking hay	0	2	6
Carting hay to stack	0	6	10
Cutting wheat	2	1	6
Twine, 29 lb.	0	12	1
Stooking...	0	17	5
Carting to stack and stacking	4	1	2
Covering stack	0	2	6
Digging drain round stack ...	0	1	0
Threshing	9	18	7
Carting wheat to barn... ...	0	9	1
Recleaning and grading ..	5	5	8½
Bags	2	14	7
Covering straw stack	0	2	6
Pressing straw at 11s. per ton	6	1	5
Carting and loading straw ...	1	4	1
Carting wheat to rail	0	14	9
Rent, 15·36 acres	6	8	0
Balance, being net profit ...	76	9	10
	£136	15	1

Cr.				£	s.	d.
Agistment				0	18	3
354 bus. 45 lb. wheat at 6s. per bus. ...	106	8	6			
25 bus. 53 lb. wheat at 3s. per bus. ...	3	17	8			
6 bus. 4 lb. wheat at 2s. per bus. ...	0	12	1			
				110	18	3
11 t. 2 c. 0 q. 21 lb straw at £1 17s. per ton				20	11	5
1 t. 7 c. 2 q. 18 lb. hay at £3 3s. 1d. per ton				4	7	2
				£136	15	1

Paddock No. 5—Bayah Wheat.

Area, 10·39 acres.

Dr.

	£	s.	d.
First ploughing...	3	1	5½
Second ,, ...	3	8	3½
Third ,, ...	3	7	7
Seed, 5 bus. 7 lb. Bayah seed wheat	1	10	8
Drilling	0	17	3
Cutting headlands for hay ...	0	2	3
Stooking	0	2	8½
Carting hay to stack	0	7	8
Removing stray plants... ...	13	14	1
Cutting for grain	1	10	3
Stooking	0	9	0½
Carting wheat	2	5	1½
Covering stack	0	1	6
Digging drain round stack .	0	0	6
Threshing	5	5	8
Carting wheat to barn . .	0	1	5
Recleaning and grading ..	3	0	3
Bags, 66 at 5d. each	2	7	6
Cartage of wheat to rail . .	0	8	2½
Covering straw stacks... ...	0	1	0
Pressing straw at 11s. per ton	3	19	3
Carting and loading straw on rail	0	15	7
Rent, 10·39 acres	4	6	7
Balance, being net profit ..	28	16	4
	£80	0	2

Cr.

	£	s.	d.	£	s.	d.
Agistment				1	18	11
196 bus. 54 lb. wheat at 6s.	59	1	5			
3 bus. wheat at 3s. 2d.	0	9	6			
3 ,, ,, 3s.	0	9	0			
3 bus. 40 lb. wheat at 2s.	0	7	4			
				60	7	3
1 t. 7 cwt. 3 qr. 16 lb. hay at £3 3s. 1d. per ton .. .				4	7	11
7 t. 3 cwt. 3 qr. 5 lb. straw at £1 17s. per ton . .				13	6	1
				£80	0	2

Paddock No. 6—Rape and Barley Fodder Crop.

Area, 24·9 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	3	17	8	Agistment	9	6	9
Seed, 6 bus. 15 lb. Cape barley	1	11	6				
65 lb. rape	0	17	4				
Manure, 9½ cwt. superphosphate	2	1	4				
Drilling	1	14	4				
Rent, 24·9 acres	10	7	6	Balance, net loss	11	2	11
	£20	9	8		£20	9	8

Paddock No. 10—Lucerne.

Area, 12·7 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Cultivating lucerne	0	10	6	Agistment	3	3	6
Rent, 6 months, 12·7 acres ...	2	12	11				
Balance, net profit	0	0	1				
	£3	3	6		£3	3	6

PADDOCK NO. 10—RILEY'S FAVOURITE MAIZE.

Area, 10·2 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	5	8	7½	7 bushels seed maize, at 6s. per bushel	2	2	0
Do	2	17	8	273 bushels bulk maize, at 2s. 9d. per bushel	37	11	7
Seed, 52 lb. seed maize ...	0	7	0				
Manure, 2 cwt. 60 lb. superphosphate	0	10	11½				
Marking out drills	0	8	0				
Drilling	0	16	7				
First cultivation	0	9	0				
Second ,, ...	0	13	6				
Chipping weeds...	0	6	1½				
Pulling seed maize	0	10	1½				
Hand threshing seed maize ...	0	18	1				
Pulling and carting bulk maize	6	19	0½				
Threshing bulk maize	1	19	4				
Bags, 95 at 5d. each	1	19	7				
Rent, 10·2 acres	4	5	0				
Balance, being net profit ...	11	5	2				
	£39	13	7		£39	13	7
Half profit of maize credited to 1910	5	12	7				
Profit from lucerne	0	0	1				
Total profit for 1910 ...	£5	12	8				

PADDOCK NO. 11—RAPE AND BARLEY FODDER CROP.

Area, 31·32 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	8	2	1	Agistment	11	14	11
Seed, 11 bus. 11 lb. Cape barley	2	16	1				
96 lb. rape	1	5	7				
Manure, 17¾ cwt. superphosphate	3	16	11				
Drilling	2	16	3				
Rent, 31·32 acres	13	1	0	Balance, net loss	20	3	0
	£31	17	11		£31	17	11

PADDOCK NO. 12—RAPE AND BARLEY FODDER CROP.

Area, 28·25 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Ploughing	5	11	3	Agistment	10	5	7
Seed, 8 bus. 24 lb. Cape barley	2	2	5				
78 lb. rape	1	0	9				
Manure, 13 cwt. superphosphate	2	16	7				
Drilling	2	16	8				
Rent, 26·59 acres for six months } ,, 28·25 ,, ,,	11	8	5	Balance, net loss	15	10	6
	£25	16	1		£25	16	1

Summary of Expenditure and Receipts.

	Expenditure. £ s. d.	Receipts. £ s. d.
Paddock No. 1	46 14 1	98 19 9
,, 1A	24 3 10	43 7 2
,, 2 (part)	69 12 2	173 7 4
,, 2 ,, ...	54 3 0	94 17 3
,, 2A	60 5 3	136 15 1
,, 5	51 3 10	80 0 2
,, 6	20 9 8	9 6 9
,, 10	17 7 7	23 0 3
,, 11	31 17 11	11 14 11
,, 12	25 16 1	10 5 7
Tending stock on area	10 0 0	
Interest on half plant, valued at £798 15s. at 5 per cent.	19 19 5	
Depreciation on half plant at 10 per cent.	39 18 9	
Credit balance	210 2 8	
	£681 14 3	£681 14 3

Net profit of £1 3s. 3d. per acre for whole area of 180⅝ acres.

Statement of Profit or Loss from each Paddock.

	Profit. £ s. d.	Loss. £ s. d.
Paddock No. 1	52 5 8	....
,, ,, 1A	19 3 4	....
,, ,, 2 (part)	103 15 2	....
,, ,, 2 ,, ...	40 14 3	....
,, ,, 2A	76 9 10	....
,, ,, 5	28 16 4	....
,, ,, 6	....	11 2 11
,, ,, 10	5 12 8	....
,, ,, 11	....	20 3 0
,, ,, 12	....	15 10 6

Value of Plant.

	£ s. d.	£ s. d.
Value of plant shown in report for 1910	864 15 0	
Less 10 per cent. depreciation	86 9 6	
		778 5 6
Add cost of maize husker, sheller, and bagger purchased during 1910 ...	....	20 9 6
Value of plant for year 1910	....	£798 15 0

As this plant is used on other sections of the Farm, this total value is reduced by half, and depreciation and interest are, therefore, only charged against £399 7s. 6d. (*See* report for 1910.)

Average Costs per acre.

	Cost per acre. £ s. d.
Six-inch ploughing	0 6 1·75
Four-inch ,, ...	0 3 9·5
Drilling	0 1 8·9
Stooking	0 1 2·4
Cutting with binder...	0 2 5·8
Twine	0 1 1·3
Cutting, including twine	0 3 7·1
Carting and stacking	0 5 4
Threshing (6·14d. per bushel)	0 13 5·7

Chaff.

The amounts credited for chaff and hay are based on the price of 4s. 11d. per cwt. received in Sydney for a truck of chaff weighing 6 tons 5 cwt.

	£ s. d.	£ s. d.
Value per ton at 4s. 11d. per cwt.	....	4 18 4
Expenses from stack to truck	0 19 7	
,, rail to completed sale ...	0 15 8	
Balance, value as hay in stack	3 3 1	
	£4 18 4	£4 18 4

Straw.

Returns are based on sales of 2s. 6d. per cwt. in Sydney, for trucks averaging 5 tons 18 cwt.

	£ s. d.	£ s. d.
Value per ton at 2s. 6d. per cwt.	....	2 10 0
Expenses from stack to truck	0 13 2	
,, truck to completed sale ..	0 13 0	
Net profit per ton, value in stack not pressed	1 3 10	
	£2 10 0	£2 10 0

Expenditure and Receipts from one acre of Wheat upon the Basis of Average Cost of Operations and Returns.

Expenditure.	£	s.	d.	*Receipts.*	£	s.	d.
One ploughing 6 inches deep	0	6	1·75	26·3 bus. wheat at 3s. 6d. ...	4	12	2
Two skim-ploughings 4 inches deep, at 3s. 9·5d.	0	7	7	14·75 cwt. straw at £1 3s. 10d.	0	17	6
Drilling	0	1	8·9				
Seed	0	3	0				
Manure	0	0	8				
Cutting with binder	0	2	5·8				
Twine	0	1	1·3				
Stooking	0	1	2·4				
Carting and stacking ...	0	5	4				
Threshing	0	13	5·7				
Bags	0	3	8				
Cartage at ½d.	0	1	1				
Rent	0	8	4				
Depreciation and interest ...	0	6	10·75				
Net profit	2	7	0				
	£5	9	8		£5	9	8

Average receipts	per acre ...	£5 9 8
,, expenditure	,, ...	3 2 8
,, net profit	,, ...	£2 7 0

Weights of Hay and Straw by Measurement.

All the stacks were measured and their cubic contents ascertained. They were afterwards weighed, the following being the average weights :—

Hay.

1909.—(Weights taken from a stack of 45 tons). The weight of prime wheaten hay was 7·31 lb. per cubic foot, or 197·37 lb. per cubic yard.

1910.—Bobs hay, stack of 6,354 cubic feet, weighed 22 tons 12 cwt., equal to 7·93 lb. per cubic foot.

John Brown hay, stack of 6,004 cubic feet, weighed 20 tons 12 cwt., equal to 7·68 lb. per cubic foot.

Average weight for the two years was thus 7·52 lb. per cubic foot, or 203 lb. per cubic yard.

The cubic feet in 1 ton of hay are, therefore, 297.

Straw.

1909.—Wheaten straw weighed 2·44 lb. per cubic foot, or 65·88 lb. per cubic yard.

1910.—Wheaten straw weighed 2·58 lb. per cubic foot, or 69·66 lb. per cubic yard.

Average of two years is 2·51 lb. per cubic foot, or 67·77 lb. per cubic yard.

Cubic feet in 1 ton of straw are, therefore, 892.

Prime hay weighed approximately three times as heavy as the straw.

[COPY.] Sydney, 16th May, 1911.

Account sales of one truck chaff, No. 1,691; sold on account of Bathurst Experiment Farm.

	cwt. qrs. lb.	cwt. qrs. lb.		£ s. d.	£ s. d.
May 16th.—50 bags chaff ...	43 1 0				
50 " " ...	44 0 0				
		87 1 0	at 4s. 10d.		21 1 9
16 " " ...	13 3 0				
28 " " ...	24 2 0				
		38 1 0	at 5s. 0d.		9 11 3
					£30 13 0
Charges—					
Weighing				0 1 0	
Freight				2 5 0	
Cartage				0 18 10	
Commission				1 10 8	4 15 6
Net proceeds					£25 17 6

Account sales of one truck straw, No. 14,124; sold on account of Bathurst Experiment Farm.

	cwt. qrs. lb.	cwt. qrs. lb.		£ s. d.	£ s. d.
May 9th.—87 bundles ...	59 2 0				
84 " ...	57 0 0				
		116 2 0	at 2s. 6d.		14 11 3
Charges—					
Weighing				0 0 6	
Freight				2 3 0	
Cartage				0 17 6	
Commission				0 14 7	
					3 15 7
Net proceeds					£10 15 8

Adjustment of the Report for the Year 1909–10.

The returns for 1909–10 were based upon certain estimates for produce which had not been sold prior to submitting the report. These estimates were conservative, and were exceeded after final weighings and sales.

Straw.

In the case of straw, the total yield exceeded the estimate by 5 tons 2 cwt., and the net price exceeded the estimate by 7s. per ton; thus:—

	tons	cwt.		£	s.	d.
Actual yield of straw ...	62	4	at 17s. per ton	52	19	10
Estimated yield of straw	57	2	,, 10s. ,, ...	28	11	0
Excess of actual returns over estimate				£24	8	10

Hay.

The actual yield of hay was 4 tons in excess of the estimate. This, valued at £2 10s. per ton, equals £10.

Wheat.

The milling wheat was valued at 4s. per bushel, but only 3s. 7d. and 3s. 8d. were realised. In addition, 99¼ bushels of seed wheat, which were valued at 6s. per bushel, were sold for milling at 3s. 8d. Thus the reduced value for 478¾ bushels of wheat was £19 0s. 7d.

Maize.

A reduction is necessary in the amount credited to maize in paddock No. 2, thus:—

	£	s.	d.	£	s.	d.
Estimated half receipts	38	8	0			
Expenses to date of report	15	4	10			
Amount credited to 1909–10				23	3	2
Half actual receipts	34	10	0			
,, total expenses of crop	20	12	2			
,, net profit of crop				13	17	10
Decrease in amount to be credited				9	5	4

Adjustment.

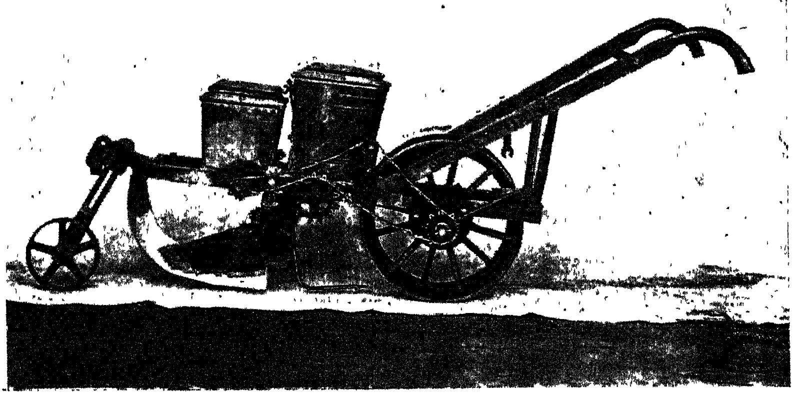
	£	s.	d.	£	s.	d.
Additional returns from straw				24	8	10
,, ,, hay				10	0	0
				£34	8	10
Decreased value of wheat	19	0	7			
,, return from maize	9	5	4			
				28	5	11
Additional profit for 1909-10				£6	2	11
Profit for 180¾ acres, as per report...				1	8	0¼
Additional profit, as per adjustment				0	0	8
Actual net profit per acre				£1	8	8¼

Maize at Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

[NOTE.—The Experiments Supervision Committee considered that portion of the following article which deals with the results of the varieties tried in 1909-10, and the conclusions drawn therefrom. They desire to invite attention to the fact that the period of ripening of a variety of maize is influenced greatly by the locality of origin of the seed; and they emphasise Mr Peacock's advice that the seed of any particular variety of maize should be obtained from a district with a climate as similar as possible to that of the locality where the seed is to be planted, if it is hoped to retain the special characteristics of the variety. As an illustration of what may happen if this is not done, it may be noted that in the trials mentioned in the accompanying article, Early Leaming maize seed, grown in the warm moist climate of Grafton, has proved too late in maturing for the cool and comparatively dry uplands of Bathurst.

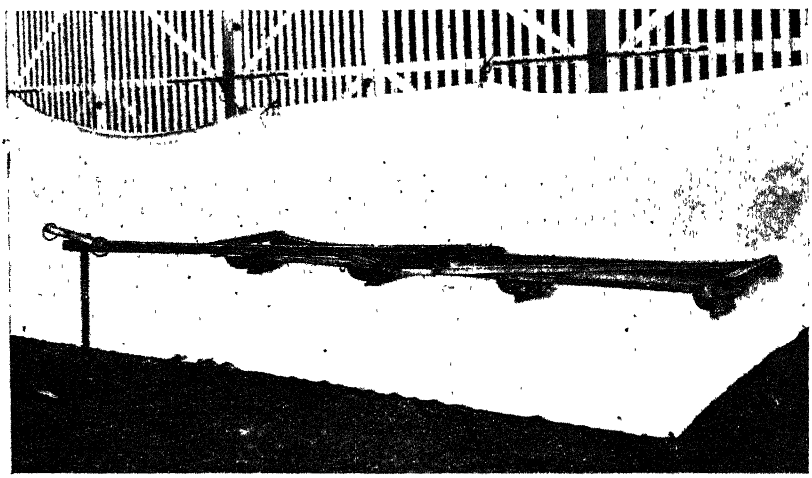
The Committee hesitated to sanction the publication of results of any variety trials conducted for one season only, particularly when, as in nearly all districts last year, the season was an unusual one. It was felt, however, that the public were entitled to know the results of the Department's work as soon as they were available. The Committee desire to warn readers against expecting that such results will be repeated in an entirely different season. When any series of experiments has been conducted for a period of, say, five years, the results will be summarised for public information; but, even then, finality cannot be expected to be reached, though valuable deductions can be drawn from the facts.—ED.]



Maize Drill, used at Bathurst Experiment Farm.

During the last ten years maize has been grown upon the uplands of this Farm in rotation with wheat. This period, throughout which the rainfall has been decidedly below the average, represents the driest decade on record. The average rainfall for the ten years, 1901 to 1910 inclusive, is 19½ inches. With such a low rainfall the district could hardly claim to be suitable for maize-growing.

The amount of rain which falls throughout the growing period is a very important factor in the growth of maize. The distribution, also, is important, as the most critical period is when it is in bloom or tasselling. Dry conditions at this time, unless the soil is well stored with moisture from previous rains, diminish the yields materially. Good January and February rains are necessary for the best results. The growing season is practically from the 1st October to the end of March.



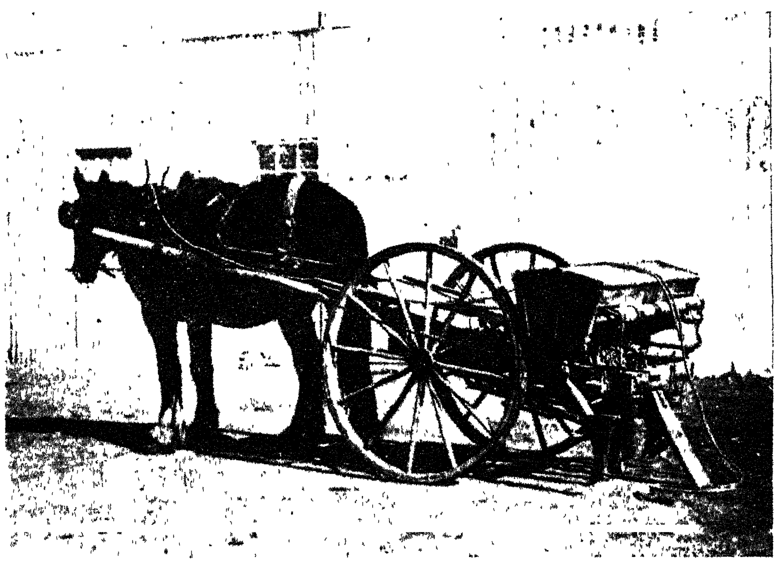
Maize Drill Marker, used at Bathurst Experiment Farm.

The rainfalls for this period and the yields are interesting:—

Year.	Rainfall for Growing Period.	Yields per Acre.
	Points.	
1901-2 ...	703	Mostly cut for silage.
1902-3 ...	1,142	20 to 26 bushels.
1903-4 ...	947	15 ,,
1904-5 ...	823	17 to 21 ,,
1905-6 ..	1,070	21 to 35 ,,
1906-7 ...	1,239	20 to 22 ,,
1907-8 ...	1,081	20 to 22 ,,
1908-9 ...	1,068	9 to 12 ,,
1909-10 ...	1,536	27 to 33 ,,
1910-11 ...	1,322	27½ ,,

These figures are not strictly comparable, as very variable soils were cropped, those of one year varying considerably from those of the preceding, and so on.

The crop of 1901-2 practically failed for grain production, and the bulk of it was turned into silage, for which the extreme droughty conditions were largely responsible. During the ten years, the yields of four seasons were reduced by frosting.



Wheat Drill, cut down to sow maize, Bathurst Experiment Farm.

Varieties.

The comparatively short growing period between late spring frosts and early autumn ones favours quick-maturing varieties. Those which have proved most suitable are Riley's Favourite, Funk's Yellow Dent, Golden Drop, and Hickory King. The last-named is a white variety, and hardly early enough for some contracted seasons.

Cultural Methods.

The land is ploughed during autumn or early winter, and allowed to lie fallow for several months prior to seeding. By this means moisture is ensured to augment the rainfall throughout the early growing period, which

is frequently too limited. The land is again ploughed, and marked for drilling. The drills are placed 5 feet apart, as the rainfall is inadequate for thickly-sown crops. When sown too thickly the cobs are small, necessitating more labour in handling, and yields are reduced. The grains are distributed singly about every 15 to 18 inches. To ensure this, graded seed is used from selected cobs, the grains from either end of the cob being discarded. By marking the drills with the marker shown, they are uniform distances apart, which is important for after cultivation. Time also is saved, as the horse follows the marks without difficulty, and no sighting for drills is necessary.

From 30 lb. to 40 lb. of superphosphate is applied with the seed, the drill having a manure attachment. It was found by experiment that superphosphate applied broadcast before seeding did not benefit the crop, but when drilled with the seed it gave profitable returns.

All weeds are kept down by cultivation. During the last two seasons, as the corn was ripening in March, the land between the drills was ploughed 3 inches deep, and sown with Cape barley for a fodder crop. An old wheat-drill was cut down to sow between the 5 feet apart drills, and superphosphate was distributed with the seed. By this means the barley gets an early start, does not interfere with the ripening of the maize, and provides considerable winter fodder for stock after the maize is harvested.

The maize is allowed to dry thoroughly on the stalks, and threshed direct from the paddock. The cobs, with the husks attached, are picked into carts and threshed by the machine shown, which threshes and cleans the maize without first having to remove the husks as in the old method. This reduces the cost of production considerably.

The maize must be thoroughly dry before threshing. Leaving it to dry on the stalks does away with the necessity for storing in cribs, &c., and whilst it is drying the land is growing a profitable fodder crop. Cattle are turned in when the fodder crop is well grown, and they eat many of the maize stalks as well ; this does away with the labour of removing them by cutting and carting.

During the spring or early summer the whole is ploughed up and left fallow throughout the summer, preparatory to sowing wheat or other winter cereals in April. By this method a bushel of maize was grown upon the demonstration area in 1909–10 for 2s. 3d.

Comparative Results, 1909–10.

The following are observations taken upon many varieties during the season of 1909–10. They were planted in adjacent rows on the 21st October, 1909. This date was rather late ; nevertheless their seasons of growth are comparable. Notes upon their ripeness were taken after the first frosts had prevented further growth :—

Row No.	Varieties.	Seed received from.	Date of Tasselling.	Date of Ripening.	Height.		Remarks.
			1910.	1910.	ft.	in.	
10	King of the Earlies	Grafton Experiment Farm ..	25 Jan .	25 April	6	6	Very early.
12	Longfellow Dent	Bathurst ,, ,, ...	25 ,, ...	25 ,, ...	7	0	Early.
5	Iowa Goldmine	,, ,, ,, ...	25 ,, ...	25 ,, ...	6	6	
20	Pride of the North	Hawkesbury Agricultural College	27 ,, ...	25 ,, ...	7	0	
22	Argentine	Bathurst Experiment Farm ...	25 ,, ...	25 ,, ...	6	0	
24	Iowa Silvermine	Hawkesbury Agricultural College	25 ,, ...	25 ,, ...	6	6	Mostly ripe.
28	Hickory King x Iowa Silver-mine	Grafton Experiment Farm ...	27 ,, ...	25 ,, ...	6	0	
29	Riley's Favourite x Golden Drop	Bathurst ,, ,, ...	2 Feb...	25 ,, ...	6	0	Not as ripe as 28.
4	Riley's Favourite	,, ,, ,, ...	27 Jan...	.. .	7	6	Almost ripe. } Same season.
13	Funk's Yellow Dent	Seed Depôt	27 ,, ...	......	7	6	Almost ripe. } Same season.
2	Golden Beauty	Bathurst Experiment Farm ...	27 ,, ...	......	7	6	Nearly ripe.
3	,, ...	Hawkesbury Agricultural College	27 ,, .	.....	8	6	Not quite ripe ; slightly later than No. 2.
17	Golden Drop	Bathurst Experiment Farm ...	2 Feb...	......	8	0	Not quite ripe ; same as No. 3.
11	King's Early	Hawkesbury Agricultural College	27 Jan ..	... ..	8	0	Not quite ripe ; lightlylater than No. 3.
23	Hickory King...	Bathurst Experiment Farm ...	2 Feb...	... ..	7	0	Not quite ripe.
16	Extra Early Zekeley... ..	Hawkesbury Agricultural College	......	......	8	6	A little ripe ; bulk green ; too late.
18	Early Mastodon	,, ,, ,, ...	2 Feb ..	......	8	6	A little ripe ; too late ; suitable for silage.
21	Ninety-day	,, ,, ,, ...	2 ,, ...	.....	8	0	A little ripe ; too late.
27	Funk's Boone County Special	Seed Depôt	27 Jan...	... ..	7	0	Nearly ripe ; too late.
25	Marlboro Prolific	,, ...	2 Feb...	... ..	7	6	Green ; too late.
26	Cocke's Prolific	,, ...	......	... ..	7	6	Too late.
19	Early Red Hogan	Hawkesbury Agricultural College	2 Feb...	......	7	6	Too late.
6	Improved Gold-mine... ...	,, ,, ,, ..	2 ,, ...	......	8	6	Too late ; strong stalks.
7	Leaming	Grafton Experiment Farm ...	2 ,, ...	......	8	6	Too late ; weak stalks.
9	Early Leaming	Hawkesbury Agricultural College	......	......	8	6	Too late ; green.
14	Yellow Dent	Grafton Experiment Farm ...	......	.. ...	8	6	Too late.

Cocke's Prolific, Marlboro Prolific, Early Leaming (Hawkesbury Agricultural College), Golden Beauty (Hawkesbury Agricultural College.), Ninety-day, Early Mastodon, and Early Zekeley gave the heaviest yields of stalks. A heavy yield of stalks is a consideration when maize is grown for green fodder and silage.

Of the above, the most suitable varieties for the Bathurst district appear to be:—Riley's Favourite, Funk's Yellow Dent, Golden Beauty, Golden Drop, and Hickory King.

Husking and shelling maize, Bathurst Experiment Farm.

When purchasing seed maize to suit cold climates, it is wise to know where it was grown. The seed should be raised in comparatively cold districts. Varieties are apt to lose their early maturing characteristics when grown in districts with long summers and heavy rainfalls.

Maize was also grown upon the irrigation area of this Farm, the yields ranging from 60 to 80 bushels per acre. In some parts of the district very heavy yields are obtained from alluvial lands which possess the advantage of having free water within 10 or 15 feet of the surface. The moisture rises from the free water by capillarity, and materially assists the meagre rainfalls.

This report deals largely with maize-growing upon the uplands, which are the wheat lands of the district.

Sorghum Poisoning.

[From "Agricultural and Pastoral Notes" supplied to the Country Press.]

INVESTIGATIONS in respect to the poisonous properties of sorghum have been made in many of the dairying countries of the world. In Queensland, some years ago, a number of dairy cattle suddenly died while feeding on sorghum. At first hoven, or bloat, was suspected as the cause of death; but, owing to the rapidity with which the cattle succumbed, more virulent causes than those arising from the mere gorging of the animals were looked for.

Cause of Poison in Sorghum.

The number of deaths among the dairy cattle in Queensland, in the year 1903, led the Department of Agriculture in that State to a strict investigation concerning sorghum, with a view of determining whether the mortality among the cows was due to any poisonous constituents the plant contained.

It was shown that in some cases fields of sorghum, with only a dividing fence between, gave entirely different feeding results, although the sorghum from each field was fed to the cattle at similar stages of its growth. One herd would be affected on one side of the fence, while the herd on the other side, in a field immediately adjacent, thrived on the succulent fodder. In each field the cows were grazing on young sorghum.

Dr. Maxwell and Mr. J. C. Brunnich, Chemists of the Queensland Department, undertook to solve the problem, which seemed at the time to have certain elements of mystery. It was naturally a puzzling situation to dairy farmers. Without definite proof they could not be convinced that the sorghum was responsible for the deaths of their cattle.

It has been known to science for some years that sorghum and similar plants, grown in rich soils, were more liable to contain highly dangerous amounts of hydrocyanic acid—commonly known as prussic acid—than when grown in soils poor in nitrogen. It was found that the nature of different soils very largely governed the amount of these poisonous properties in the plant. This explained why some cows were affected through eating sorghum in one field, while those in an adjoining field, consuming the same class of material, did well. The changing character of the soil varied the amounts of prussic acid.

In a specific case it was noticed that one field—in which cattle were immune—gradually sloped upwards. The analysis of the soil from this field showed a deficiency in nitrogen.

Testing Sorghum Growths for Poison.

To test the relation between the incorporation of the prussic acid in the growing sorghum plant, and the ratio of the nitrogen in the soil, several plantings of sorghum were made in the Botanic Gardens at Brisbane, in soil composed almost exclusively of sand. One series of plants was not given any special manurial assistance, while another series was manured with

nitrate of soda, a manure whose chief element is nitrogen. This experiment was made in order to see whether the supply of additional nitrogen to the soil would increase the amount of prussic acid in the growing plant—nitrogen being an element of that poison.

Mr. Brunnich made repeated analyses which showed, with almost mathematical precision, that the supply of available nitrogen increases the amount of poison that sorghum and other plants are capable of making and storing up within their composition.

The Sorghum Poison at Different Stages of Growth.

Determining the stages in the growth of sorghum when the poison in it would be at the danger limit, was a very interesting and valuable phase of the investigation. It was found by the experiments that sorghum grown in highly rich, nitrogenous soils could not be freely fed to animals with safety until the plant is preparing to seed.

The sorghum plant—grown under the conditions described—when very young, and from the age of 3 up to 7 weeks, contains distinctly dangerous amounts of prussic acid. After that age the poison rapidly disappears by decomposition, the nitrogen passing over into other and strictly nutritious elements of food. When the flowering stage is reached, not more than a trace of the poison is found.

As the growth of the plant does not entirely depend upon the age or the number of weeks since it was planted, it is as well to speak of its stages of development. It may be generally stated that the sorghum plant is not safe for feeding until it reaches the flowering or seeding stage.

When Young Sorghum is Mixed it is not Dangerous.

Dr. Maxwell reported that even sorghum, and such plants as may be known to contain dangerous amounts of prussic acid, may be judiciously used as a green mixture with dry hay chaff to make the feed tasty to animals. When diluted in this way, the green sorghum being very carefully stirred up and mixed with large quantities of the dry feed, no harm will follow. The dry feed is, in this way, also made capable of use.

That there is a danger in allowing stock free course to the young growing sorghum is beyond doubt, since it has been proven that the whole trouble is due to the presence of the poison as stated. The fact of the poison being prussic acid accounts for the sudden fatalities immediately following when cows have free access to sorghum produced under the conditions outlined. The prussic acid rapidly spreads through the system, and has an almost immediate fatal effect.

It may be mentioned that these plant-poison investigations have been extended to include maize, sugar-cane, and most of the grasses in use. Prussic acid has been found in quantities varying from nil—a mere trace—and up to the danger point. So far, however, only *Panicum muticum* comes anywhere near the sorghum plant in its dangerous content of the poison. Sugar-cane and paspalum dilatatum were found free of prussic acid. Traces were found in maize produced in rich soil, but not near the danger limit.

Our Experiment Farms.

J. E. O'GRADY.

GRAFTON.

Manager—A. H. Haywood. *Experimentalist*—(Vacant.)

THE "Burringbar" ran up the coast before a south-easterly breeze, following a gale which had blown itself away to the far north. On the evening before making the Clarence, as the steamer rose and fell in the long seas, the genial captain entertained us with tales of the early days of North Coast settlement and trade, with an occasional reminiscence of sterner doings in the days of sailing ships.

At daylight we crossed the Clarence bar, and left the steamer at Yamba —where the Grafton people go for sea breeze and surf bathing when the inland heat becomes unpleasant. Here we changed to the river launch, which runs direct to Grafton, whilst the steamer calls to unload cargo at the several townships between the heads and the city of the Clarence.

The lower portion of the 48 miles run is made through green canefields, reminding us that though the White Australia policy has been accomplished by legislation, sugar is still produced on the Tweed, the Richmond, and the Clarence. As we approach Maclean, however, maize and potatoes make their appearance, whilst the rapid changing of cans at farmers' jetties shows that dairying, the destiny of the North Coast, has a firm grip upon the queen of our coastal rivers. On past Lawrence, Ulmarra, and the other river townships, we see every evidence of permanent prosperity; for this is a district of rich alluvial soil, fair but not excessive rainfall, and the cheapest of all means of intercommunication. Its only want is proper connection with the outside world, either by removing the sand-bar from the mouth of the river, or by rail connection with more favoured outlets to the open sea. But hitherto the Clarence has progressed in the absence of both, and Grafton, the capital, is a thriving centre of commerce.

The Experiment Farm is situated on Alumny Creek, 7 miles north-east of Grafton. The original intention was to pick 1,000 acres of the poor sandstone country lying between Grafton and Casino, but through an error some of the best land in the Clarence district was chosen. Grafton Farm is, therefore, probably the finest property in the possession of the Department of Agriculture, and only very recently has a small area of the poor land been acquired for experiment purposes.

The total area of the Farm is now 1,002 acres. There are about 300 acres of alluvial clay loam, some 200 acres of basaltic soil, and 200 acres mainly poor sandstone country, but including a considerable proportion of conglomerate rubble, which is very useful for road-making on the Farm.

The clay loam is the best soil. It has an average depth of about 18 inches, and is friable, with a high percentage of humus, so that it is easily worked and retains moisture well. The subsoil is a fairly stiff clay; hence this soil is not similar to the deep alluvials of the river banks. The Farm boundary is 2½ miles in a direct line from the Clarence.

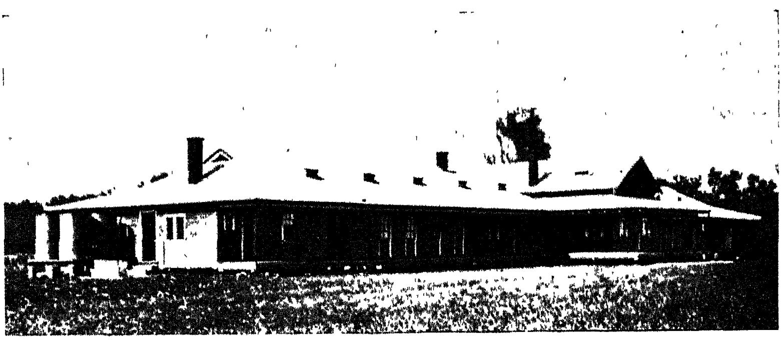
Next in value comes the basaltic soil, which is of the usual type. It covers the higher portion of the Farm, is deep red in colour, and greasy in texture, though it sets fairly hard in dry weather. The mould-board never "cleans" in it, but it does not dry out as quickly as the Richmond River volcanic soils, which it resembles in many respects. Though there are little belts of similar soil in the Clarence district, it is not typical of any considerable area.

The Piggeries, Grafton Experiment Farm.

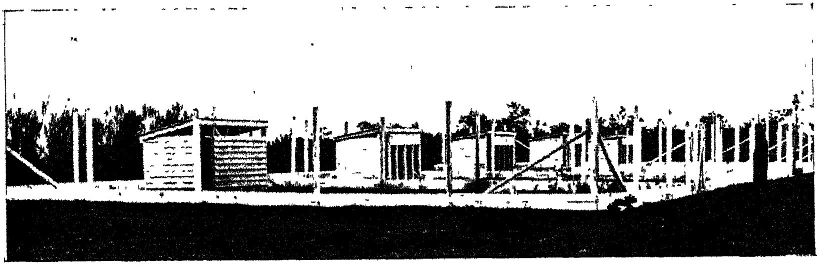
The sandstone soil is a fair sample of the poor country formed by the decomposition of the Clarence sandstone beds, described by Dr. Jensen in the *Gazette* for December, 1910.

Though Grafton Farm was established twelve years ago, its development has been delayed very much, and a good deal of the land proposed to be cultivated is not cleared yet. The area actually under the plough is only 160 acres. About 460 acres more have been ringbarked, whilst 300 acres of land, which may be cropped, are still in their native state. There is an area of 75 acres, originally a forestry reserve, which is to be retained to show the native timbers and undergrowth of the district, as well as to form a

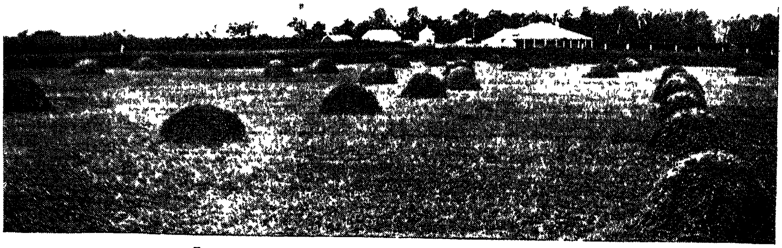
Manager's Cottage, Grafton Experiment Farm.



Apprentices' Quarters, Grafton Experiment Farm.



Fowl Runs, Grafton Experiment Farm.



Lucerne on basaltic Soil Grafton Experiment Farm.

Workmen's Cottages, Grafton Experiment Farm.

A Crop of Grey Mammoth Cattle Pumpkins at Grafton Experiment Farm.

shelter-belt and breakwind. Native birds are preserved, but the blacks from the adjoining Aborigines Home are encouraged to destroy the scrub vermin, such as wallabies and paddymelons.

Buildings.

As it is proposed to accommodate twenty farm apprentices at this station, quarters have recently been erected for that purpose. The illustration given does not convey an adequate impression of the building, as, owing to its length, it was necessary to place the camera at an angle in order to include the whole. The structure was designed by Mr. Adam Brooks, Works Overseer of the Department, and is the Department's "last word" in buildings of this kind. It is built of district hardwoods, and provided with excellent ventilation. It is roofed with iron, coated with Arabic paint, and lined with T. and G. hardwood. The apprentices at Grafton will certainly have comfortable quarters. They will also have one great advantage which students at some of the other farms cannot now receive—practical experience in clearing land on a fairly large scale.

The manager's cottage was erected some eight years ago, but has now been painted red like the other buildings. The colour has been chosen to match as nearly as possible the red volcanic soil on which the buildings stand.

A five-roomed cottage for the Experimentalist and two cottages, each of four rooms and kitchen, for herdsman and foreman respectively, complete the list of recent additions, and the whole block has a very pleasing appearance when viewed from the Southgate-road. Two other workmen's cottages were built some years ago.

The farm buildings—stables, barn, &c.—were put up in the early days of the Farm as temporary arrangements, and now need replacing by substantial buildings in keeping with the remainder of the farm steading.

A weakness of the Farm at present is the water supply. The water in Alumny Creek is brackish, whilst that in Miller's Waterholes is polluted with organic matter. Well water is easily obtained, but it is highly mineralised. The yields of milk from the dairy cows are not as great as they will be when an adequate supply of pure water is available.

Potatoes.

Both the alluvial soil of the Farm and the deep alluvials found on the Clarence banks are ideal potato soils, and potatoes will be the main commercial crop at the Farm. The basaltic soil gives lighter yields than the alluvial, but good results are obtained, and it may be used for change of crop. Chemical analysis indicated that the alluvial soil does not require manuring for potatoes, but last year a spring crop of Adirondacks, covering 6½ acres, gave 51½ tons, or an average of 7·9 tons per acre, showing a net profit of over £50 per acre. This result was largely due to the fact that the area included an acre of small plots, on which various combinations of manures were being tested. One of these plots gave 14 tons 18 cwt. per acre, and three others exceeded 13½ tons. This serves to show the advantage of manuring even rich land when growing potatoes.

This year, 21 acres of spring crop potatoes have been planted. Small autumn crops will be grown for educational purposes and to meet Farm requirements, but autumn crops of potatoes have not been a commercial success on account of the prevalence of blight. The autumn is the wet season on the North Coast, and the weather conditions favour the spread of the disease, whereas the spring is generally dry.

Variety trials are made in the experiment plots each year.

Maize.

The cultivation of maize at Grafton Farm has been described and illustrated by Mr. Haywood in October *Gazette*. As the land is not fully

Hand Winch Tree Puller in use at Grafton Experiment Farm.

cleared, it is not yet possible to employ the larger implements with which it is proposed that the commercial crops shall be grown. Already, however, considerable quantities of maize are grown from the seed selected from the stud plots, and the best is sold to Clarence River farmers for seed. The two varieties recommended for grain in the district are Early Leaming and Yellow Dent. Until experiments indicate that either can be replaced by a better variety, the work of improving these will be continued, and as large areas as possible will be sown with the stud seed. The resulting seed, true to type and not inbred, should help Clarence farmers materially in maintaining the standard of their produce.

Wheats.

The average price paid for chaff for working horses on the Clarence is from £5 to £6 per ton. Wheat is not grown in the district on account of

the prevalence of rust. The work of the late Mr. Farrer, completed by Mr. Sutton, resulted in the production of two wheats—Warren and Thew—which are highly rust-resistant and eminently suitable for haymaking on the North Coast. The difficulty which retards their general cultivation is in obtaining seed. Wheat will not produce grain in the moist coast districts, whilst these two varieties are rather light yielders of grain in the true wheat-belt, so that their cultivation elsewhere would only pay if high prices were charged to North Coast farmers for the seed. The Department has arranged for considerable quantities to be grown at other Experiment Farms, the grain to be sold on the coast at reasonable rates. Meanwhile farmers are invited to examine these varieties in the paddocks at Grafton Farm. An area of 3 or 4 acres of Thew looked splendid at the end of August, showing no sign of rust.

Lucerne.

To a casual observer, it is a matter for wonder that more of this splendid fodder is not grown on the higher rivers. The average yields from the area actually sown are the highest in the State, beating even the yields of the Hunter and Tamworth. Indeed, such a result would be expected from those deep alluvial soils in a warm climate of summer and autumn rains. Some explanation of the matter is afforded by the fact that the North Coast is pre-eminently the land of weeds.

At the Farm there are 13 acres of lucerne, 4 on the flat and 9 on the volcanic soil. The alluvial flat gives the best results; but lucerne does well on the basaltic soil, as the illustration shows.

To ascertain the best implement for keeping down weeds and renovating old lucerne pastures, Mr. Haywood proposes to test the disc harrow against the chopping roller. The latter implement was illustrated in last issue. It is heavy, but lucerne will stand a lot of cultivation on the North Coast. Mr. Haywood tried to plough out a small area, but the crop came up beautifully afterwards. Once the weed problem is overcome, we can expect a great extension of the area devoted to lucerne on all the higher rivers.

Other Legumes.

The general cultivation of any leguminous crop would tend to increase the average milk-yields on the coast. Paspalum and couch are good grasses, providing an abundance of summer feed, and the same remark applies to the more recently introduced Rhodes grass. But both are weak in protein, which is essential for best results from dairy cattle. All the legumes are rich in this ingredient. Lucerne is worthy of extended study and experiment, even on the higher areas with their stiff clay subsoils. The notion that it is only suitable for deep alluvial soils is now almost buried, though, of course, it gives best results under those ideal conditions.

But even without lucerne, the North Coast farmer has a fairly wide choice for his leguminous crop. At Grafton Farm, cowpeas do well; and as they

can be grown in either spring or autumn, they can be fitted in well with a rotation. Besides providing splendid fodder, they are an excellent crop for renovating exhausted land.

Field-peas, grown with wheat, oats, or barley, have proved a failure, probably because the climate is too warm ; but vetches take their place. The best soiling crop yet grown at the Farm was barley and vetches. This combination would also provide winter feed.

Florida velvet beans are strongly recommended by the Manager as a renovating crop on old ground, and to provide a change of feed for stock. They have done remarkably well at the Farm. Mauritius beans are another good legume, but their growing season is much longer than that of Florida velvet beans.

A Flooded Gum in the act of falling, Grafton Experiment Farm.

Indian Cane.

This wonderful cane is now accepted by the majority of Clarence River dairymen as at least a temporary solution of the winter feed problem. Right along the river little clumps of it may be seen in the paddocks. In most cases it looked quite fresh and green at the end of August, but occasionally a brown withered patch showed that it is susceptible to frost.

The cane was apparently introduced to this State by a native of India. Mr. Haywood, recognising its value to dairymen, assisted in its general cultivation, contributing two articles to this *Gazette* (October, 1908, and

January, 1911). Plots have been grown for some years at Grafton Farm, and cuttings are sold annually to dairy farmers at a moderate price. That it is giving satisfaction is proved by the large number of plots along the river.

Cattle Pumpkins.

A photograph, taken by Mr. George Marks, North Coast Inspector of Agriculture, is given of an acre of Grey Mammoth cattle pumpkins grown last year at Grafton Farm. The yield was estimated at 40 tons. Lime-dusting was used to fight the pumpkin beetle, and the method was so successful that not a single hill was blank in the acre. These pumpkins were invaluable as feed for pigs and sheep.

Grasses.

A number of introduced grasses are being tried in plots at the Farm. The one which gives the most promise is *Melines minutiflora*, a native of Brazil. An article on this grass by Mr. J. H. Maiden, Government Botanist, will appear next month, together with some notes from Mr. Haywood.

Paspalum, so universal in other parts of the North Coast, is not commonly met with on the Clarence. The annual rainfall is much lighter there than on the Richmond and Tweed, or in the mountainous country to the south towards Coff s Harbour, and paspalum requires a great deal of moisture to reach its full perfection. The main paddock grass around Grafton is couch; and as white clover grows freely amongst the couch, a very good summer pasture is formed.

Melines minutiflora appears to suit Clarence conditions better than paspalum or couch, though it is yet only in the experiment stage.

Tall Fescue grass (*Festuca elatior*), a native of central New South Wales, is also promising.

Rotation of Crops.

It has not yet been practicable to set aside a definite area at the Farm for the purpose of experimenting in rotation of crops, but Mr. Haywood considers that a suitable rotation would include maize and another cereal, cowpeas, and potatoes on a limited scale. These are about the only four crops which could be expected to be profitable commercially. The weakness of the scheme lies in the fact that cowpeas cannot be made into as palatable hay as clover or lucerne.

Cattle.

There are 130 head of cattle at Grafton Farm. The average number of cows milked is about thirty, the cream being separated and sent to Grafton Butter Factory.

As this has not been regarded as a dairy farm, the practice has been, until recently, to send culls and accidental crosses from other Experiment Farms to Grafton, where there is plenty of grass. The herd is, therefore, a mixed one, with few pure-bred stock. Lately, however, the Department has obtained some pure-bred Shorthorn cows for Grafton, and a pure-bred Guernsey bull is on the Farm. Hitherto the practice has been to rear the

heifer calves from the best of the cows, and some of these, though not high-class dairy animals, look promising.

Sheep.

Practically all the mutton consumed on the North Coast comes from other districts. Breeding for wool will never be profitable on the coast, but if a breed of fair mutton sheep can be obtained to withstand the conditions, it may open up an avenue of profit, as the price of mutton locally is high.

The Romney Marsh is the only breed which is at all likely to be hardy enough, and 115 specimens of this breed are now on their trial at Grafton.

A fallen Swamp Mahogany, showing how the Hand Winch Tree Puller runs the roots without grubbing.

They are not increasing rapidly, and they appear to suffer from worms, but the experiment will be continued until a definite conclusion can be obtained. At the end of August they were grazing on lucerne.

Pigs.

Including youngsters, there are about 160 pigs on the Farm. Experiments in cross-breeding are in progress, the aim being to obtain an animal which will reach a dead weight of about 120 lb. at five months old. So far, Middle Yorkshire boar on Berkshire sow seems to give the best result. It is anticipated that Poland China x Berkshire would be a good cross. A Poland China boar was recently imported, but died during an operation from heat apoplexy. Large Black and Large Yorkshire boars have been tried, but the progeny grew too big for requirements.

Poultry.

Northern River eggs are an established product on the Sydney market. They bring a lower average price than suburban new-laids, but they come in early in the spring.

The main reason why River eggs are regarded as second grade is that they have to come by the steamers, which often incur considerable delay in crossing bars, or are handicapped by bad weather at sea. When the North Coast railway is opened these perishable products can be sent down by rail in some twelve hours; and as the general rule with suburban poultry-farmers is to market their eggs but twice a week, River eggs will be in a fair position to compete with the product of the County of Cumberland.

"Stoving" a burning stump, Grafton Experiment Farm.

When that time comes, the prospects of poultry-farming on the North Coast appear to be very bright. The green-feed problem, which occupies so much of the suburban poultryman's time and labour, ceases to be a problem in the land of weeds. Lucerne grows prolifically, and, except perhaps for young stock, can replace the bran and pollard which most Cumberland men have to buy. The cost of feeding, estimated in Sydney district at 1½d. per fowl per week, can be reduced almost to vanishing point on the North Coast.

Mr. Haywood has a nice little flock of forty head of White Leghorn pullets, of the very best strains, selected by Mr. Bradshaw. Sires of first

quality have also been provided. In August these hens were laying freely, and the results formed a sharp contrast to those given by the ordinary strains in use in the district.

The reduced cost of feeding would also seem to make table poultry a profitable line. The heavy breeds, such as the Black Orpington, which are good table birds and winter layers, have failed to hold their own with the specialised egg-producers, the White Leghorns, in the Sydney district. How they will come through the comparison on the North Coast can as yet be only surmised; but their chances are good, as the main objection raised to them in the south is the quantity of expensive food which they eat.

The poultry-houses and pens at Grafton Farm, shown in the illustration, were built by a local bush carpenter to designs supplied by Mr. Haywood. These neat structures, painted white and standing on a green carpet of grass and herbage, are very attractive. The fencing-wire along the top of the netting, to prevent sagging, is not as commonly seen as it should be amongst poultry farms. The wide board below the netting serves to protect the fowls from the wind until shelter trees grow.

No experiments have yet been made with ducks, but Mr. Haywood is desirous of trying them, as well as other laying and utility breeds of fowls, under the conditions of Grafton Farm.

Contagious Abortion.

C. J. SANDERSON, M.R.C.V.S., Government Veterinary Surgeon.

THIS disease, which is, unfortunately, very prevalent in this State, is the cause of great loss to many dairy farmers, directly by decreasing the total milk yield of their cows, and indirectly by preventing them bringing their cows into profitable use at a time when it would be most advantageous to do so.

Although contagious abortion is common in all domestic animals except dogs, cats, and swine, it is most commonly observed in cows, and is responsible for the greatest loss to the cow-keeper.

Nature of the Disease.

Contagious abortion is now defined as a contagious catarrhal inflammation of the pregnant womb, with a dropsical condition of the fœtal membranes, due to the presence in the womb of an organism, and resulting in the premature expulsion of the fœtus.

The work of various investigators, including M. Nocard and Professor Bang, of Copenhagen, proved beyond all doubt that the disease was due to a bacillus, discovered by Bang, which, entering the body by various channels, has the seat of its activity in the womb. When it arrives at this organ, it sets up inflammation of the fœtal membranes, resulting in a discharge which separates the calf from the walls of the womb, cuts off its nourishment, and causes its expulsion. The after effect of abortion is to cause an animal which has once aborted to repeat the process, or to become permanently sterile.

Paths of Infection.

Although it seems certain that the organism may reach the womb in various ways, there are two methods which are far more likely than others to convey it. The first is by feeding on the material containing the organism, such as forage or grass contaminated with the discharges from the uterus of an aborted cow. The second is by the introduction of the bacillus into the vagina, as by medium of the bull during service.

The disease can only be spread by the organism (bacillus) which causes it entering the cow, and the sources from which the bacillus is obtained are the discharge from the uterus (womb) and vagina of the cow, together with the aborted fœtus and afterbirth.

Methods of Spreading the Disease.

Contagious abortion usually owes its appearance on a farm to the purchase of an affected cow in a saleyard, or from a farm where the disease exists. It is impossible to say whether an in-calf cow is affected with the disease or not,

She may appear quite healthy, but may abort shortly after purchase. The explanation of this is the fact that some months may elapse after a cow becomes infected with the germs of abortion before the calf is expelled. Dishonest men sometimes deliberately place recently aborted cows in sale-yards, sometimes with a calf which is falsely represented to be hers.

Bulls purchased from a herd where abortion exists are also a great factor in originating the disease in a herd, as also are bulls lent to a neighbour who has the disease on his farm. Such bulls will carry the disease back and infect the first cow they serve. Once abortion has gained a footing in a herd, the bull is undoubtedly the chief means of spreading the disease, as he receives the germs on his penis when serving a cow that has aborted, and conveys them to cows which he subsequently serves. The bull is, of course, not infested with contagious abortion; he merely serves as a medium of conveyance of the disease from one cow to another.

A clinical thermometer placed in the vulva of a recently aborted cow and subsequently inserted, without having been washed, into the vulva of a clean cow, has been known to produce the disease by conveying infective matter from one animal to another.

Abortion may be conveyed from one animal to another by actual contact, by the hands of the attendant, by means of litter soiled with discharges from the womb, and especially by contaminated water in drinking pools. Forage that is thrown down often becomes soiled by discharges from aborted cows, and, if eaten, may cause the disease in clean in-calf cows.

Symptoms of the Disease.

It must be understood that contagious abortion does not cause any very serious constitutional disturbance as a rule. Men often refuse to believe that their cows can be affected with a contagious disease, pointing out that the animals are showing a bright eye and sleek coat, chewing the cud, and generally manifesting the appearance of perfect health. Often no evidence of calf-slipping is noticed, but the disease takes the form of a temporary sterility, the animal returning to the bull at frequent intervals. Failure to recognise this as abortion of a contagious nature is the cause of many cows becoming affected, as, before the true character of the trouble is recognised, the bull may have served half the herd.

When conception does take place, the abortion, as a rule, occurs from the third to the seventh month. Often a cow aborts without showing any previous symptoms. When symptoms are noticed, they include sudden decrease of milk yield, slight swelling of the lips of the vulva, and a blood-stained sticky discharge. After the abortion has taken place, the blood-stained sticky discharge may persist for months.

When the disease is known to exist on a farm, examination of the hind parts for a discharge should be a matter of routine, as frequently that is the only means of detecting that abortion has occurred.

For the first two or three abortions in the same animal, the calf is born dead. In most cases the calf is carried longer each year until it comes to

full term, indicating that there is a gradual acquirement of immunity. These cows, though they do not abort, are yet capable of giving the disease to others. Though the bacillus, which is the cause of the disease, has lost the power to cause abortion in that particular cow, yet it may be still living in the genital canal of this naturally immunised cow, and be capable of infecting a healthy animal. This fact has largely to be taken into account in outlining treatment.

When a cow has aborted she frequently retains portions of the afterbirth. Sometimes these unexpelled fœtal membranes cause a chronic inflammation of the womb. Occasionally, as a result, several gallons of a dirty brown fluid, swarming with organisms, are manufactured in the womb, the closure of the *Os uteri* (neck of the womb) preventing its escape, sometimes for many months. Eventually it is expelled, and contaminates everything it comes in contact with, often resulting in a fresh access of the disease.

The last two instances represent chronic cases of abortion, which complicate matters and render treatment both prolonged and difficult.

Treatment—General.

To avoid chronic disease and sterility, early and effective treatment is necessary. The point which stockowners must understand is that this disease leaves the womb in an unhealthy condition, which must be rectified before normal calving can be again established. The longer the period which elapses between the abortion and the commencement of treatment, the more difficult it is to effect a cure.

The necessity for putting the diseased condition right before allowing the cow to the bull is not fully grasped, and cases occur when a cow slips her calf one day and takes the bull the next. *Treatment of the cow must be followed by keeping her away from the bull for two months or more, in order to re-establish normal conditions of her breeding organs. Constant vigilance is required when the disease exists to detect signs of slipping the calf, so that treatment can at once be commenced.*

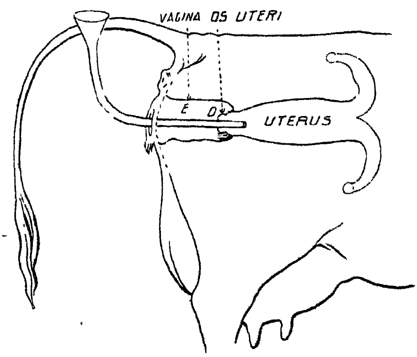
Isolation of Aborting Cows.

Cows that have been seen to abort, or keep returning to the bull, should be isolated. Effective isolation means that such cows not only do not come in contact with the healthy animals, but that they are fed, watered, and milked separately. The herd, free of the disease, should not even be allowed to pass over the paddocks grazed by the infected cows. Cows that show any symptoms of premature calving should be kept in a confined space and carefully watched. Should they abort, the finding and destruction of the aborted fœtus is assured. A bull that has never been in contact with an infected cow should be kept for the healthy cows.

Method of Treating Aborted Cows.

All aborting cows should have the uterus irrigated daily for a week or ten days with a 1 per cent. solution of lysol. This is made by adding 2

tablespoonfuls of the drug to 10 pints of water. It is as well to use that quantity at blood heat, to thoroughly wash out the uterus, distending the folds, and bringing the disinfectant in contact with every part of it. This irrigation can be carried out by means of a 3 feet length of thick india-rubber tubing of ½ in. diameter and a small glass or enamelled funnel; but a pump is recommended for the purpose.

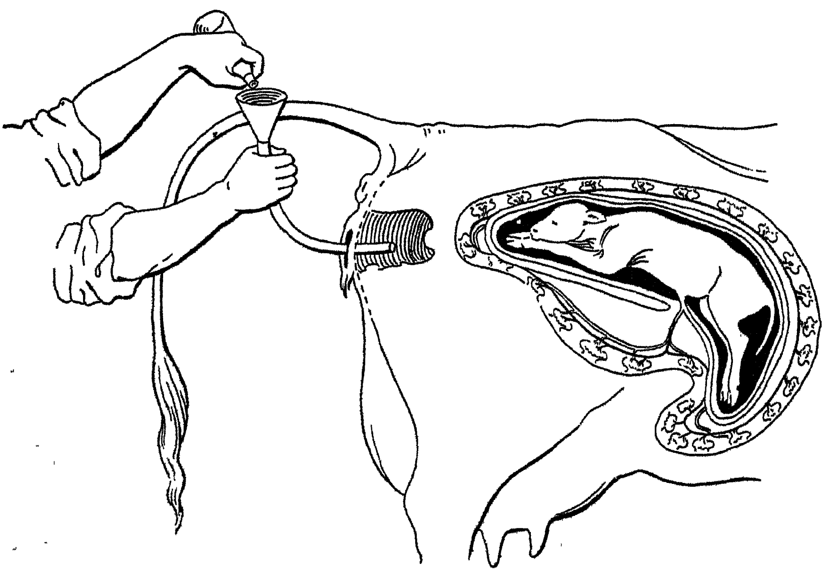


Genital organs of a Cow.

To wash out the womb with a piece of rubber tubing and a funnel, introduce the fore end of the pipe into the womb of an aborted cow or the vagina of an in-calf cow, and pour the disinfectant into the funnel. (See illustration.)

Lysol is the disinfectant recommended, but 1 part of mercuric iside to 5,000 parts of boiled water; or 1 part of corrosive sublimate to 1,500 parts of water have also been used with most satisfactory results.

A glance at the attached diagram of the genital organs of a cow will show that the nozzle of the syringe must be passed through the neck of the uterus (marked D) into the body of the uterus, to carry out a uterine irrigation. In doing this the nozzle of the syringe should be oiled, and, together with the rubber tubing, soaked for some minutes in the solution before inserting into the womb.



Method of washing out vagina.

In cases of recent abortions, the entrance to the womb will be found to be open, but later some little difficulty may be experienced in passing the nozzle through the neck into the womb. If it cannot be readily done, force must not be employed, but an endeavour should be made to dilate the opening by inserting first one finger and then later two fingers. It frequently happens that, by a little manipulation, an entrance can be effected and a nozzle introduced.

At the same time the hind-quarters, udder and tail should be well washed with some cheaper disinfectant, such as Jeyes' fluid, in the proportion of of 2 tablespoonfuls to 5 parts of water. At the end of a week or ten days, if there is no discharge from the parts, treatment should cease, and the cow should not be allowed to the bull for two months. Prior to putting a cow to the bull a careful examination should be made for signs of discharge, and if any are found, treatment should be again resorted to twice a week until the discharge ceases.

One of the most fatal mistakes which farmers make in treating this disease is that of using uterine injections which are too strong. They fail to realise that the uterus is a delicate organ, and that *a too strong solution of drugs introduced into it will absolutely destroy it as a breeding organ.* Use any drug at the recommended strength, and no more. Be patient with cows which show no desire for the bull for some time after treatment, and remember that using injections of the strength recommended *often delays desire for the male for months.* Do not, therefore, on any account start to treat such a cow again unless there is a discharge, as you will be only making things worse.

Disinfection of Premises.

All abortions should be burnt, and uterine discharges covered with lime or sprinkled with some non-poisonous sheep dip.

In Australia, where the great majority of the cows are milked in open sheds and not housed, the disinfection of premises is not of such great importance as in countries where cows are hand-fed in sheds all the year round; but, as a measure of precaution, all milking bails and sheds should be thoroughly disinfected with some strong disinfectant, such as 2 lb. of bluestone dissolved in 10 gallons of water. This should be repeated occasionally.

Treatment of the Bull.

When abortion exists in any herd, the bull should always be treated before and after serving a cow. To do this, the animal should be secured in a crush or by roping him. The sheath should be grasped with the left hand, and the nozzle of the syringe inserted an inch or so inside the sheath and held in position with the same hand, while the right hand is used to pump the solution into the sheath and over the outside. It is a good plan to cut off the long hairs of the prepuce.

Enema syringe for disinfecting Bull.

The same solution that is employed for the cow should be used for the bull. The syringe used is an ordinary enema syringe, as illustrated. Bulls soon become accustomed to this practice.

The treatment outlined above is undoubtedly effective, and no other form of treatment is necessary in order to effect complete eradication of the disease. It sometimes happens, however, in herds where a large number of cows are affected at the same time, that it is advisable to treat all the herd as a precautionary measure. In such a case, actually aborting cows receive a uterine irrigation, while in-calf cows have the nozzle of the syringe passed into the vagina (see diagram of genital organs, marked E), and that portion of the genital tract only is washed out. At the same time, the udder, tail, and hind-quarters generally should be washed. The strength of lysol solution used should be as for washing out the womb.

Prevention.

A.—When the disease exists on a farm, to prevent it spreading:—

(1.) Isolate aborting cows and treat them as directed.
(2.) Burn or otherwise destroy abortions and discharges.
(3.) Disinfect premises to destroy germs of disease.
(4.) Treat bull before and after serving cows.
(5.) Treat contact cows by washing out the vagina.

B.—To prevent the disease invading a clean farm:—

(1.) Disinfect bulls coming fresh on to the farm.
(2.) *Don't* lend bulls to a neighbour.
(3.) When purchasing fresh cows, isolate them till they have produced a full-term calf.

Lactic Acid Cultures for White Scour in Calves.

The Bureau of Microbiology are making experiments with lactic acid cultures as a remedy for the trouble known as White Scour in calves; and although the value of the treatment is not yet beyond question, the results obtained at the Berry Stud Farm are certainly hopeful. The cultures are supplied weekly from the Bureau, with the following instructions:—

1. Boil a gallon of fresh milk, and allow it to cool till just warm to the hand.
2. Add the contents of the bottle of culture supplied, shaking out the clotted milk if necessary.
3. Set aside in a warm place (in the kitchen), but do not apply heat until the milk thickens.
4. Add half to one cupful of the thickened milk to the calves' milk or other food twice daily.
5. Each day—between supplies—add a cupful of the thickened milk to a fresh gallon of boiled and cooled milk, and use as directed above.

Arrangements have now been made to have further trials of this remedy made by a Richmond River dairy-farmer, to whom supplies of culture are being forwarded weekly.

Attractive Rural Homes.

On the 21st December, 1909, the following circular was sent to all field officers of the Department of Agriculture :—

ATTRACTIVE RURAL HOMES.

It is proposed to issue a Farmers' Bulletin suggesting means which may be adopted for increasing the attractiveness of farmers' homes, and I have to request, therefore, that you will be good enough to furnish me with notes,—and where practicable, photographs,—of any attractive, comfortable homes which you have observed. It is desired that you will give the fullest particulars available, such as the ground plan of the dwelling and other buildings, arrangement of water supply, sanitary conveniences, gardens, orchard, and grounds generally.

Particulars are not, of course, desired of homes that are expensively arranged and beyond the reach of the average farmer of the district.

I shall be glad if you can give this matter your early attention.

H. C. L. ANDERSON,
Under Secretary.

Some extracts from replies received to the above circular are as follow :—

1. I have given the matter careful consideration, and on my rounds have made close observations. As a result, I have come to the conclusion that there is not one home in my district which could be held up as a model.

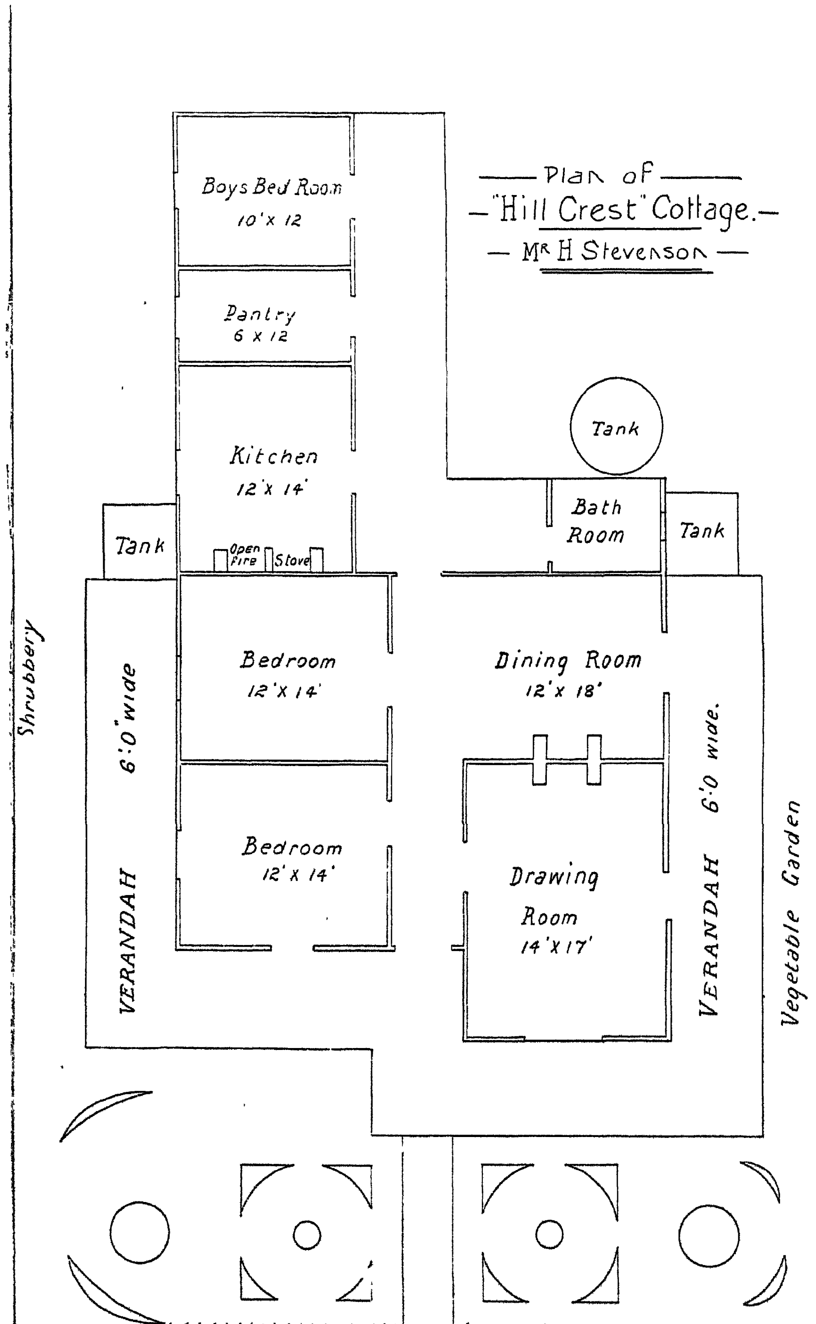
2. Respecting the obtaining of photographs and plans of attractive rural homes, I am afraid that it would be impossible in this district.

3. There are *no* attractive rural homes in this district.

Some of the officers, however, succeeded in obtaining photographs and plans of what were considered in their districts to be fine homes of the more economical class, and these were forwarded to head office. With the aid of the artist, a few of the best pictures were selected for inclusion in the proposed Bulletin, and the matter was laid aside with the expectation that many more would come to hand. The first batch, however, were the only ones received, so the idea had to be shelved.

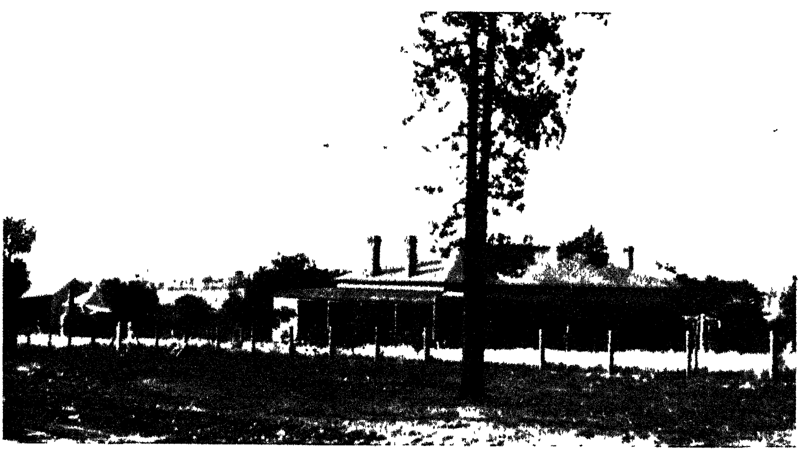
Mr. H. W. Potts, Principal of the Hawkesbury Agricultural College, who makes a special point of urging students to beautify their homes, has now raised the question again by forwarding extracts from *Country Life*, an English journal, containing a series, "The Lesser Country Houses of To-day." These are illustrated descriptions of some of the finest houses in rural England, and might be compared with the series, "The Pastoral Homes of Australia," now appearing in the *Pastoralists' Review*. Mr. Potts urges that we should supply farmers with any information which will help them, not to build homes of the types mentioned, but to make the best use of the means at their disposal to beautify their farms and homesteads.

It is not our purpose to criticise the judgment of struggling men. This series is being prepared with a view to affording illustrations of the best types of farmers' homes, built by men of moderate means, in the hope that such homes may become general throughout the country. No attempt will be made to reflect glory on the State by selecting the finest examples of



Attractive Rural Homes.

"Hillcrest," residence of Mr. H. Stevenson, Fruit-grower, North Richmond.



"Hazeldene," Mr. J. E. Whiteley's residence, Geurie.

ATTRACTIVE RURAL HOMES.

architecture which can be found in rural districts. Each cottage illustrated should be well within the means of the average farmer who has passed the first few years from his ringbarking stage; and whilst none may slavishly copy any example shown, the series will give farmers suggestions which may be of value to them.

Selection will first be made from the material already supplied by Departmental officers. Other illustrations are expected to come to hand from time to time, and farmers who consider their homes a credit to their district and to themselves are cordially invited to send in photographs and sketch-plans, with full details of surroundings. These will be published if, in the judgment of the Department, such a course would tend to improve the general character of our country houses. Whilst, then, we can still retain kindly memories of the old slab home with its bark roof, we shall relegate it back to the sturdy pioneering days to which it belongs, and set ourselves to the task of making the country look what it really is—the home of a hard-working but prosperous people.

1.—Mr. Henry Stevenson, North Richmond.

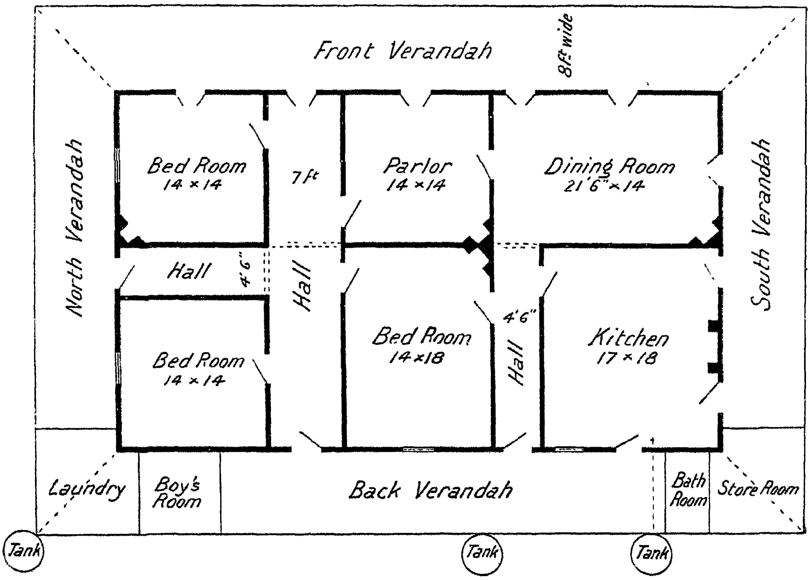
It is, perhaps, in our orchard districts that we can expect to find the best examples of neat, inexpensive cottages. Whether it be that the clean, regular rows of trees, with their bright spring blossoms and golden fruit, inspire the owner with a desire to erect nothing which will mar the beauty of the scene which his own industry has created; or whether the very nature of this industry serves to attract men of taste who desire to go on the land; it is a fact that the planting of orchards is frequently followed by the erection of pretty homes.

Mr. H. A. Wood, Fruit Inspector, has sent in the photograph and plan which are reproduced here. All may not agree with the manner in which Mr. Stevenson has arranged the rooms of his cottage, but no one can deny that he has obtained a very pleasing effect at reasonable cost. The water supply is obtained from three tanks,—two of 400 gallons, and one of 1,000 gallons. As the district is one of fair annual rainfall, the roof catchment is sufficient to meet requirements. The area surrounding the house is devoted to the cultivation of flowers and vegetables, which, besides meeting requirements, add much to the attractiveness of the home.

Mr. Stevenson has an orchard of 40 acres, chiefly citrus fruits—common orange, Emperor mandarin, and Lisbon lemon. Summer fruits are also grown, mainly for home consumption.

2.—Mr. J. E. Whiteley, Geurie.

In the western wheat country, the first requirement in home comfort is water supply, and the second is coolness. Most farmers have been compelled by necessity to provide plenty of catchment and storage for water. The general use of corrugated iron as a roofing material is often criticised by visitors to the west. Let them first tell us what can replace it as a satisfactory means of catching rain-water for household use.



Plan of Mr. J. E. Whiteley's residence, Geurie.

Attractive Rural Homes.

Mr. Whiteley has provided his home with abundance of ventilation, as will be seen from the ground plan. As the halls run in all directions, a light breeze can be made to reach any of the rooms. A fanlight is placed over each hall door. The verandah is 8 feet wide all round the house, thus protecting the walls from the hot summer sun. The large kitchen is also used as a dining-room for the men employed.

In addition to the roof catchment, Mr. Whiteley has water laid on from a dam for use in the orchard, flower and vegetable gardens, so that he is in a position to keep his home attractive, even when dry spells remove all traces of green from the surrounding countryside. He finds that the following shrubs and creepers thrive in his district:—Holly, oleander, tree lucerne, *Pinus insignis*, *Laurestinus*, and plumbago, Virginian creeper, wisteria, climbing roses, and Japanese honeysuckle.

The total cost of erection of this home was a little under £500. That amount should be quite reasonable for the majority of our wheat and sheep men of a few years' standing. Mr. Whiteley's plan is, therefore, submitted for their consideration.

The Daimler Road Train.

(Renard System.)

The Agent-General for this State in London forwards the following report by Mr. J. Davis, Consulting Engineer in London to the New South Wales Government, who recently visited the Coventry Works of the Daimler Motor Company for the purpose of witnessing the special trials of the new Daimler Road Train (Renard System):—

I have the honor to report that, in response to an invitation from the Daimler Motor Company, I visited their works at Coventry, and witnessed trials of the New Daimler Road Train (Renard system).

The train consisted of a locomotor and four waggons, each carrying 4 tons. No difficulty was experienced in negotiating the soft, rough ground which was situated in the vicinity of the works, and consisted, in some parts, of rubbish-heaps. The special steering-gear enabled the train to take sharp curves in such a way that each pair of wheels of the waggons followed the track of the first pair of wheels on the locomotor.

I have had the Renard system of road traction under observation for some months past. It has now reached such a state of perfection, under the management of the Daimler Company, that, for conditions where it would pay to adopt, it could be recommended with safety and confidence.

In the Renard system each vehicle in the train is mechanically propelled and steered from the locomotor. The propulsion is effected by means of a universal shaft running throughout the entire length of the train. The power is transmitted from this shaft to the centre pair of wheels of each vehicle, which is mounted on six wheels, the central pair being used for propulsion. Each vehicle of the train is automatically and independently steered, so that it follows in the exact track of the locomotor.

The locomotor is an 80-h.p., six-cylinder, valveless type engine, manufactured by the Daimler Company. It is claimed that the trains, when geared and fully loaded, can ascend a hill having a gradient of 1 in 5, or traverse soft roads and tracks.

I was supplied with the following particulars of the cost of running one of these trains. No doubt the cost per mile would have to be increased, owing to the difference between the wages given below and those current in New South Wales:—

Composition of Train—Motor, and three open goods waggons following.

Tare Weight of Train—13 tons 10 cwt.

Useful Load carried—15 tons 8 cwt.

Gross Weight of Train—28 tons 18 cwt.

Miles run—51·66 miles.

Average Speed—8·65 miles per hour, including traffic and railway-crossing stops.

Petrol Consumption—

Train miles, per gallon, 1·61.
Net tons miles, per gallon, 24·79.
Gross ton miles, per gallon, 47·33.

Day's Expenses. 27th October, 1908.

	£ s. d.	£ s. d.
Petrol, 32·4 gallons, at 10d. per gallon	1 6 8	
Driver, per day	0 6 0	
Assistant, per day	0 4 0	
Oil and sundries	0 2 6	
Actual out-of-pocket expenses...	£1 19 2	1 19 2
	£ s. d.	
Repairs, 5 per cent. on capital, 300 working days to year	0 10 10	
Depreciation, 20 per cent. on capital, 300 working days to year	2 3 6	
Interest on capital, 5 per cent.	0 10 10	
Estimated allowance expenses	£3 5 2	3 5 2
Day's total expenses		£5 4 4

Cost per net (or useful) ton mile—

$$= \frac{\text{Day's total expenses—}}{\text{Day's total mileage} \times \text{average weight of each load carried}}$$

$$= \frac{\text{£5 4s. 4d.}}{51{\cdot}66 \times 15{\cdot}4}$$

$$= 1{\cdot}57\text{d. per ton mile.}$$

The above, I understand, was a long daily run in one way only.

For conveying produce in country districts to railways, the train would be most useful. The motor is light, and the maximum load, as compared with other traction engines, on any axle is low. The advantage of its adoption would be unquestionable, provided the cost per mile per ton compares favourably with the cost per mile per ton of usual method of traction.

I understand that one of these trains has been supplied to the South Australian Government, and another is about to be sent to the Chillagoe Mines, Queensland.

Should further particulars be required, I shall be able to supply them.

The Sheep-maggot Fly.

In the Victorian *Journal of Agriculture* for June, Mr. H. W. Ham, Sheep Expert, reviews the several suggested remedies for maggot-fly in sheep, and concludes with the following remarks. There is nothing new in the suggestions, but they must certainly form an essential part of any organised attack upon the pest, and, moreover, can be applied on the individual holding with benefit :—

One of the most practical means will be to prevent the breeding of flies. The effects will be only gradual, but will certainly lessen the evil. Destruction of carcases of rabbits and stock, wherever practicable, will tend to reduce their number. In many cases expenditure on rabbit-poisoning could be better applied, especially if near markets or railways, to encouragement of trapping and increased destruction of harbours. By thus lessening the amount of decomposing material about the country, the development of the fly would, in a great measure, be prevented.

Painting.

A. BROOKS, Overseer of Works.

THE object of painting is to preserve the more perishable parts of a structure from the effects of the weather; and, properly speaking, all woodwork to be painted should be thoroughly seasoned, otherwise the paint, by confining the sap and moisture, only hastens decay. New work usually receives three coats, the first or priming coat and two more, and each coat should incline towards the required finished shade or tint of colour.

The selection of colours is a matter that requires some experience if the blending is to be agreeable with the surroundings. Generally, the wish of the owner of the house is consulted; but after a little argument it is usual to find that the painter's suggestions are taken and acted upon.

For outside work on weatherboard cottages, it is now very fashionable to paint the walls in red, terra cotta, or green, with the windows and other parts picked out in either white or buff. Doors may be in dark greens or in browns.

It must always be borne in mind that when two different colours are placed side by side they must be of very different shade, one being light and the other dark. Stone colours are much used, one reason being because they are more easily mixed by an amateur than greens, greys, or buffs. The durability of the various colours, or rather the materials used to produce them, varies less than is generally supposed. All colours fade somewhat, and the darker colours, such as olive or sage greens, show the effect of fading more plainly than most others. These will stand better if put on over a coat of red—that is, white lead coloured with Venetian or Indian red, and yellow ochre. Yellows bleach out by exposure, and browns take on an ashy appearance.

Staining and varnishing is often done to the walls of wooden buildings externally instead of painting, and, beside looking well, is cheaper. The stain may be boiled linseed oil, oil of creosote, or linseed oil mixed with umber, vandyke brown, sienna, or other staining pigments, and a coat of varnish put on to finish with. This may be done on either hardwood or pine boards.

All work, whether inside or outside, should be carefully prepared, if a a good job is desired. The whole should be carefully cleaned down, all knots of a resinous nature treated with a coat of knotting varnish or glue size, and the first coat carefully applied. When this has dried, all cracks, nail holes, &c., must be properly stopped with putty, and rubbed off smoothly. The putty must not be put in until the first coat has been applied, otherwise the wood will absorb the oil out of the putty and it will fall out. Before the second coat is applied the first must be thoroughly hardened and dry, and the same applies to the last coat.

In preparing old work for painting, it is necessary first to see that all repairs to windows, doors, mouldings, &c., are done by the carpenter, and then to clean down as before mentioned, raking out all loose putty; and

where the surface is bad or blistered, it will be necessary to rub off with pumice stone and water. Use a lump of pumice with a flat face on it, and rub off the old paint down to a smooth surface. All putty in the sashes should be looked to, and if necessary, cut out and renewed. All ironwork, such as verandah roofs, gutters, down pipes, and tanks, should be scraped off clean, and these should be painted in one coat only, to a finish.

Materials used.

Briefly, the materials of which ordinary paint is composed are white lead, linseed oil, driers, turps, and various other ingredients to obtain the required colours. The latter are called "stainers."

The oil soaks into and fills the pores of the wood, forming a resinous surface which keeps out the air. The driers quicken the drying process of the oil, and the white lead gives a body to the paint, combining with the oil. Turps (or turpentine) is used merely to save oil and make the paint spread or work more freely. It soon evaporates, and takes no part in protecting the wood. Red lead is generally used with the first or priming coat, as it dries well and sets hard.

Proportions of Lead, Oil, &c., to use.

The following should make sufficient paint to cover about 100 square yards of new work :—

	Red Lead.	White Lead	Raw Oil.	Boiled Oil.	Turps.	Driers.
	lb.	lb.	pints.		pint.	lb.
First coat	1	15	6	....	....	....
Second coat ...	....	15	4	....	$\frac{1}{2}$	$\frac{1}{4}$
Third coat	....	13	$2\frac{1}{2}$	....	$1\frac{1}{2}$	$\frac{1}{4}$

For flatted work mix the lead with turps only.

For outside work $1\frac{1}{4}$ pints of raw and $1\frac{1}{4}$ of boiled linseed oil may be used for the last coat, instead of $2\frac{1}{2}$ pints of raw oil.

Colouring Pigments generally used for common colours.

Stone colour: Burnt Turkey umber, raw Turkey umber, yellow ochre.
Drabs: Burnt umber and yellow ochre.
Buffs: Yellow ochre and Venetian red.
Greys: Lamp black, Indian red, ultramarine blue, vermillion.
Brown: Burnt sienna, Prussian blue, yellow ochre.
Greens: Brunswick greens, dark and light; with blue and chrome yellow.

Mixing.

The white lead is ground to a paste in oil, ready to mix with more oil, &c., as stated, to prepare it for use. The colouring matter is mixed in a similar way and added to the white lead and oil until the required tint is obtained. The whole is then strained, either through a piece of canvas (usually a piece of chaff bag tied over the mouth of an oil drum), or a fine-mesh wire strainer, the paint being worked through with an old brush. If found to be too thick for immediate use, a little oil and turps may be added. The strainer when finished with should be placed under water, to keep it soft and fit for future use. If mixed paint has to be laid aside for a few days, it should be covered with a little water to prevent a skin forming on the surface.

Brushes.

The most useful sizes are 8·0 brush for ordinary work, with Nos. 3 and 6 sash tools and flat fitches for small work, such as edges around window sashes and frames, or picking out colours on mouldings. The larger brushes should, when first taken into use, be loosely bound with string about half way down the bristles, the ends of the string being secured with tacks, one on each side. New brushes should also be set a few hours in clean water or raw oil before taking into use. At no time when out of use should they be exposed to the air, but set into clean water, say, 2 inches deep, sufficient to keep the ends of the bristles soft. To clean a dark colour out of a brush so that it can be used in a lighter colour, work it briskly in a little raw oil, which can afterwards be used in other paints. To clean a brush that has been neglected, soak it in hot turps, kerosene, or strong solution of washing-soda.

Application.

See that the surface to be painted is cleaned down—that is, all dust brushed off and anything that requires rubbing down is attended to, as previously recommended, either with pumice-stone or glass-paper.

Start at the top and work downwards, so that if any paint falls off the brush it will not injure the finished work. Apply quickly and evenly, leaving no brush marks, and finish with the grain of the wood. If the paint seems to run, it is either too thin or the surface is not clean—probably greasy, if you are painting old work. This should be given a coat of hot lime-wash, and allowed to dry before paint is applied. Always allow one coat to be thoroughly hard and set dry before applying the next.

If doing outside work, select fine weather when neither dust nor flies are about, as nothing makes the painter more annoyed than to have a dust-storm rise when he is applying the finishing coat.

It is a general idea that the first coat should have only a small proportion of white lead in it. It should really be just the opposite, and have rather more than the next coat, because white lead clings to the wood with far more tenacity than any other of the ingredients in paint. The best lead will keep its hold long after the oil with which it has been mixed has disappeared, forming the "chalky" surface so familiar on old buildings, fences, or gates.

A Useful Lime Wash.

The following mixture may be used on rough timber, brickwork, or corrugated iron, and will reduce the temperature of houses when applied to the roof, equally as well as the best refrigerating paint sold:—

10 lb. of fresh unslaked stone lime; 1 lb. glue; 1 lb. powdered alum.

Slake the lime with hot water, keeping it well covered over during slaking. Dissolve the glue, also the alum, in boiling water, and add to the already slaked lime, taking care not to make too thin. Strain the whole as for paint, and cover over for two days or more, when it is ready for use. Apply with an ordinary two-knot whitewash brush, giving the work two coats, the first to be thoroughly set before the next is applied; and if on roofs or tanks, apply in cool weather. Colouring matter (ochres) may be added if necessary. A little blue improves at all times.

The Cold Storage of Eggs.

G. BRADSHAW.

OF all the products of the farm, stock, or crops, eggs are the one commodity whose prices in the cheap spring months afford a fairly accurate guide as to what they will be in six months' time, *i.e.*, in the following April, May, and June. If the price is (say) 6d. per dozen in September and October, it can be safely predicted that in early winter it will be about three times that figure. Should 10d. per dozen be the spring price, as in the present and past year, then it can be relied on that 2s. to 2s. 4d. will be a regular quotation in the following April, May, and June.

This feature of the egg market has always and in all countries obtained, and is directly attributable to the fact that the breeding time of egg-producing birds is in the spring; and although, through domestication, fowls and ducks now lay eggs in every month of the year, nature asserts herself. For despite this domestication, favourable environment, special time of hatching, and many homilies on how to get eggs in winter, the average production in the winter months is only about one-third of that of the spring period, and there is no evidence that this proportion is likely to increase largely.

The following figures from the Hawkesbury Agricultural College Egg-laying Competitions show the production in September and October against that in April and May, by the same flock of hens, and substantiate the long known fact of the flush spring production:—

		April and May.	September and October.
Second competition—420 hens	... ...	4,408	16,310
Third ,, 600 ,,	... ...	5,766	21,045
Fourth ,, 600 ,,	... ...	7,046	23,761
Fifth ,, 600 ,,	... ...	12,499	23,234
Sixth ,, 360 ,,	... ...	4,740	14,954
Seventh ,, 300 ,,	... ...	4,620	12,296
Eighth ,, 360 ,,	... ...	5,335	14,584
Ninth* ,, 300 ,,	... ...	4,252	11,527

It will be seen that, although the proportions laid vary in the respective competitions, the average for the whole series is about 74 per cent. in September and October, as against 26 in the winter months of April and May.

Nor do the figures tell all, seeing that the production mentioned is from the first-year hens, which are always the best layers in April and May.

* Including 60 hens in Dry Mash Test.

Hens in the second year's laying drop, say, 20 to 25 per cent. from those of the first year, and when kept to the third year there is a further drop. The experience of all poultry-keepers, which is also confirmed by the egg-laying competitions, is that the reduction in the laying of the two and three-year-old hens is always in the two months mentioned, their production in the spring months being almost equal to the performance of the younger birds.

Indeed, it is safe to say that, in an ordinary flock of fowls of mixed ages, of every hundred eggs laid in the four months, but fifteen or twenty will be produced in April and May, against eighty to eighty-five in the following September and October. These facts are the contributing causes of the widely-separated values of this product in the two seasons mentioned. Farmers, householders, grocers, poultry-breeders, and others, always realising this, have from early times occupied their minds in attempts to preserve or hold over the surplus quantities of the cheap months until the winter or dear period.

At the present time, five methods of preserving eggs are in existence, all more or less effective. They may be termed the wet, the dry, the heating, the exhaust, and the cold methods. Over a century and a quarter ago in London, William Jaynes was granted letters patent for preserving eggs. The formula, with perhaps some amendments, is in extensive use in England and other countries at the present time, and is the well-known lime-pickle. This, however, has of late years been largely superseded by the water-glass method, which is thoroughly reliable for small quantities. Since that time over eighty patents have been granted in the United Kingdom for preserving eggs, and a few in Australia and New Zealand. The majority, however, have been interesting experiments rather than commercial methods.

The wet methods are usually the well-known pickling. The dry methods are more simple, and consist in packing the eggs in dry bran, pollard, salt, sand, or other substance, and keeping them in a cool place. The hot method is dipping the eggs for about thirty seconds in water heated to about 115 degrees. This coagulates what is called the pellicle under the shell, and thus excludes the air. The exhaust method is a later-day scientific discovery, and while reliable is, through the necessity of a special plant, adaptable only when large quantities are to be treated. The cool method is that known as cold storage, and there is no doubt but this is the most effective. New-laid eggs kept in well understood cool store conditions are, at the end of six months or more, scarcely distinguishable in appearance and quality from what they were when delivered by the hen.

The earliest reference to the cold storage of eggs in this State appeared in the first edition of my pamphlet on "Poultry Breeding for the Local and English Market," early in 1897. In the chapter on Preserving Eggs, after giving many formulæ, the following appeared :—

> However practicable any or all the above systems may be, the freezing chamber or cool method is for all purposes the best. The only thing to do is to pack the eggs in boxes or other receptacles, and keep in the cool chambers. at a temperature slightly above freezing point—say, 32 to 36 degrees—and there is no further trouble. With this temperature the eggs can not only be kept an interminable time, but can be sold, and

have been in thousands of dozens, as new laid, and fetched in England top market price Nor is there any deception in describing them as such, for in a temperature as noted, everything in the egg is held in suspense. There is no process of decay; consequently they retain all their original qualities, which cannot be said of those treated by many other processes. The one great handicap to this plan is, that it cannot be generally adopted, from the fact that there are at present no cold-storage chambers with a proper and continuously regulated temperature; and were there such, and a moderate charge made, I feel sure they would be well patronised; nor need there be any doubts as to the nature of the results. Before leaving the subject, I should observe that the possibilities of the egg trade, through the instrumentality of cold storage, are very great, and I look forward to the time when huge quantities will be stored in this way during the cheap season, and kept until the scarce time, which would do much to restore an equilibrium in the summer and winter prices, and still further assist in making poultry-breeding as valuable an adjunct to the farm as it should be.

When the publication was circulated, inquiries were made at the Secretary's office as to the practicability of the system, many having faith in cold air as a preservative, but would not subscribe to the remark that eggs could be kept for many months perfectly fresh. Others said the thing was a theoretical fad. One then well-known city grocer asserted he had tried the system and found it a failure.

During these discussions, experiments at the Export Depôt were being conducted, my representations of the results being such that a properly regulated chamber was secured by the Board for Exports, and placed at the disposal of poultry-farmers and others, thus opening a hitherto closed road to the rightful earnings of their poultry flocks.

It should be mentioned that some of the experiments were expensive failures, and were conducted, not so much in the way of temperatures, but as to the best method of packing. Chaff, hay, pea-husks, straw, and other materials were all used with more or less success, resulting in the following regulations being issued in 1898, which remained in existence, with additions, till the Department terminated the cold storage of eggs :—

> *Regulations.*—All eggs for cold storage must be forwarded, carriage and cartage paid, to the Government Export Depôt, Darling Harbour, where they will be received and stored on the owner's account, and at his sole risk, and the Government will not be responsible for any loss or damage said to have occurred while the eggs are in store, from whatever cause arising. Cases must be of the kind known as patent packers, each holding thirty-six dozen, properly packed in cardboard fillers, as supplied with the cases.

In a résumé of the operations of the Board for Exports for the year 1898, the Secretary wrote :—

The extreme fluctuations in the egg market, and the fact that in early summer the prices obtainable here are unremunerative, induced the Board to suggest experiments in shipping; but on experimenting in 1897-8 with samples in cool storage, it was found that they could be kept, almost unimpaired, for six or eight months; and this being so, the local market offered much greater inducements than the export trade. It was, therefore, decided to offer to producers the benefit of cool storage at a low rate, to enable them to secure the higher prices ruling in autumn and winter. This offer was taken advantage of by growers in the southern and western districts, and by several local people

There have been stored during the present summer about 10,000 dozen eggs, which are now being marketed, the profit, after deducting storage, being such as to at once place this method entirely beyond the speculative point, and practically revolutionise the egg market.

It is anticipated that in future eggs—if fresh—will never come much below 9d. per dozen.

Chaff, straw, and all other packing should be dispensed with, as experiments have proved that they only encourage mustiness.

The moderation of the storage charge (1d. per gross per week) will enable almost any grower to hold eggs over from season to season, and it is confidently expected that many will take advantage of this system in future.

In 1900 several inquiries by those having cold stores reached the Department as to methods and temperatures, and were responded to by the publication of extended regulations and directions, which included the following:—

The first requirement, and an essential one, is that the air must be kept perfectly dry; experiments in chambers where this cannot be attained have invariably failed. The temperature must be regulated to as near 32 deg. Fahr. as can be managed, the extreme average range throughout the room being 31 degrees to 34 degrees. A strong draught is unnecessary. The eggs must not be coated with any preservative which will close the pores of the shell, nor should they be washed. Washing is especially to be avoided, as it softens the pellicle within the shell, besides providing a suitable means of conveying the mycelia of various fungoid growths to the inner and tender portions of the egg. Eggs for cold storage should preferably be infertile, but this is not absolutely necessary.

Each year from the commencement of the system, the Department published the quantities stored, and except for one or two years when the prices were excessively high, they have shown an annual increase, culminating in 1910, with the huge quantity of 620,372 dozens, or considerably over seven million eggs, valued at more than £40,000.

Of the above, there were 16,677 cases of 36 dozen each in shell, and 5,000 tins of 40 dozen each in pulp. The latter are mostly used by the large cake manufacturers. This system of storing, while as practicable for their purpose, is a more economical way than by storing in shell.

The enormous increase from the 11,000 dozens of twelve years ago emphatically confirms the prediction made prior to the inception of the business: that rather than forcing the eggs on a 4½d. and 5d. market, the time would arrive when huge quantities would be stored and kept until the dear time, thus securing to the poultry-breeder the legitimate earnings of his poultry.

Quantities of eggs stored since the commencement of the business:—

	Doz.		Doz.
1898 ...	11,000	1905 ...	288,648
1899 ...	93,000	1906 ...	250,322
1900 ...	96,000	1907 ...	250,000
1901 ...	140,000	1908 ...	305,044
1902 ...	130,000	1909 ...	497,976
1903 ...	151,000	1910 ...	620,372
1904 ...	258,908		

Neither does the above represent all the eggs that reach the cool chambers, being those stored at the four large city establishments—the Fresh Food and Ice Company, the Glaciarium, the Metropolitan, and Messrs. Birt & Co. There are quite a number of small places in the city and suburbs, where from a dozen to one hundred or more cases are put away each year, but owing to the difficulty in securing the returns from these places, the Department has never attempted to enumerate them.

It must not be thought that everything went smoothly in the early days of cold storage. Indeed, there were many things to contend with. A great deal of advocacy for the system and persuasiveness had to be brought to bear on the producers. When told that taking the eggs off a cheap market would fetch up the price, they did not dispute the statement, but retorted that marketing them in the scarce time would have the opposite effect. Others contended that it was the grocers and speculators who were reaping the benefit from cold storage, overlooking the fact that these people, by taking their two or three hundred or more cases off the market weekly, were making a better price for the poultry-keeper. Then as each delivery season arrived there were occasional complaints about faulty eggs, but in almost every instance, when investigated, the trouble was found to be due to a departure from the printed regulations, which told the people who stored to be particular as to new laids, and not to wash the soiled eggs. Rather than this, when a summer glut took place in Sussex-street, such was relieved by sending them to cold storage, the awakening coming when these were delivered six or eight months afterwards.

When cold storage of eggs was commenced, those most sanguine of its results believed that the storing of considerable quantities would have a levelling effect. That is, that while the summer price of 6d. might be brought to 9d., the winter 1s. 9d. would be reduced by the same amount, the advantages being that the 3d. of a rise in spring would cover a time of plentifulness, while the reduction of 3d. in autumn and winter would obtain at a time when eggs were scarce, and be of smaller effect. While the breeder would be benefited in spring by 3d. per dozen on, say, three dozens, he would be losing 3d. in April on but one dozen. Such was good theorising, and had it been realised to the letter, meant much to the poultry-breeder; but more fortunate still for the breeder, while the September and October 6d. has now reached 9d. or 10d. in the spring months, the winter figure, rather than showing a decline, is considerably better than at any time prior to the advent of cold air as a preservative. I am not prejudiced enough to attribute the advanced rates at either season altogether to the cold-air system, for eggs, through the prosperity and better buying ability of consumers, are advancing in price the world over. At the same time, had the above extraordinary quantities been left on the local markets, there is no doubt but there would have been a considerable slump in prices.

The financial results of egg-storing may be briefly put as follows:—

The larger portion of new-laids were placed in store during the past season at 9½d. to 11d. per dozen. When taken out from five to seven months afterwards, there was from 2d. to 3½d. per dozen storage charges against them, and when put on the market they sold at from 1s. 5d. to 1s. 9d. per dozen. Fivepence per dozen profit is not unusual, and there must be some mismanagement when the profits per case are under 10s. per case of 36 dozen.

Every season, no matter where stored, although minor complaints are heard, the overwhelming proportion of those placed in the cold rooms are delivered to depositors in a perfectly sound condition. The fact of eggs

being delivered to depositors in a bad state arises from two causes: Either they were put into the room faulty, or the manager of the rooms failed to keep the temperature right.

Were all the eggs stored in May, June, or July, there would no cause of complaint against the owner or agent, for at that time all eggs are in excellent condition. Even in the past June, Northern River eggs were of such good quality that they occasionally realised as much as suburbans.

Storing in winter is, however, out of the question, and would entail heavy losses to those who attempted it. September and October are the months when the greatest quantities are placed in the cold rooms, and it is very rarely that complaints are heard of the condition in which these are delivered in the following April or May. From November the quality of the river ones deteriorates, and on the arrival of quantities in excess of market requirements, they have been hurried off to the cold stores without any examination. In such instances good results need not be expected.

I am well aware that the majority of the agents in the summer time "candle" all the Northern eggs prior to sale or storage, and destroy all the "blacks." At the same time, when the temperature on the steamers reaches 94 deg. Fahr. and upwards, the germ of the egg quickens into life; and when this has only taken place the day prior to arrival in Sydney, the affected ones cannot be detected by candling. These eggs would leave the candler in an assumed sound state, but through the germs shortly afterwards dying, they would become rotten, even in the cold rooms.

The suburban poultry-farmers, who store new-laids only, rarely have any complaints; but should the eggs turn out unsatisfactorily, it is reasonable to assume that the temperature was at fault. In addition to the poultry-farmers putting only new-laids in store, there is one other way in which they can assist the sale, viz., by discarding the old brown cardboard fillers and using the white ones, which give the eggs a better appearance. When eggs of good quality, as above, are put in the store, the risk is then transferred to the engineer or manager of the respective works.

Concerning temperature there is a good deal of misapprehension. Many think that as 32 deg. or 33 deg. Fahr. is called freezing point, eggs kept at that temperature would become frozen and consequently unsaleable. Such is not the case. All substances have certain temperatures at which they freeze and boil, and the freezing temperature mentioned applies to water only. Eggs can be subjected to as low as 28 deg. Fahr. and be perfectly safe; while if kept at 30 deg. Fahr. they will retain their new-laid qualities for a longer period than those kept at 35 degrees or higher.

A temperature of 24 degrees or 25 degrees will freeze eggs hard. Those newly laid, with scarcely any air space, will crack at that temperature. They are perfectly sound when thawed out, but whether cracked or not will soon go bad, through the pellicle of yolk having become broken, and then becoming mixed with the albumen. A stale egg, one with a much larger air space, can be subjected to a lower temperature without cracking.

While the cold store managers are always anxious for their rooms to be kept at an even temperature, thus ensuring good results, sometimes, through inadvertence or expediency, conditions arise which cannot contribute to a good result. In a series of rooms, numbered, say, from 1 to 6, No. 4 may contain eggs, with those adjoining, Nos. 3 and 5, empty, and consequently the cold air locked off. In the course of business these rooms may become filled with meat, necessitating a temperature of from zero to 10 deg. Fahr. or over. This low temperature will in a varied time, according to the quality of the insulation, penetrate into the adjoining egg-rooms, and through lack of alertness on behalf of those in charge, frozen eggs, which really mean spoilt eggs, will result.

In connection with misadventure or other cause which may result in goods deteriorating in the freezing rooms, cold store proprietors usually store eggs subject to no liability. As to condition, there are several instances when, through some cause, more or less damage did arise. It is said that, despite the no-liability clause in the regulations, the claims of the few depositors were reasonably met.

GUAR (*Cyamopsis tetragonoloba*).

AT the instance of Mr. R. W. Peacock, Manager of the Bathurst Experiment Farm, the Department of Agriculture obtained from the United States Department samples of seed of this plant. It is an East Indian legume, which in America has proved itself to possess remarkable drought-resisting properties.

Small packets of the seed were sent to the Hawkesbury Agricultural College, and Bathurst, Cowra, Glen Innes, Wagga, and Grafton Experiment Farms for trial. The following reports have been received :—

Hawkesbury Agricultural College.—Seed planted 27th November, 1910, in rows 3 feet apart, and resulting plants thinned out to 15 inches apart in the rows. The plants were very slow in maturing. In habit of growth they were tall and spindly, averaging 2 feet to 2 feet 6 inches in height. Foliage, small and scanty. Pods containing four seeds, of the nature of but smaller than the average pea, were borne in bunches on branches. When quite ripe, the seed becomes very small and exceedingly hard.

This plant should be of very little value as green manure, on account of the fibrous nature of its stems and branches and the lack of foliage. The yield of seed is only fair.—A. V. DONNAN, Experimentalist.

Bathurst Experiment Farm.—Seed planted on irrigation area, 25th November, 1910. Black cowpea was also sown for comparison. The Guar did not appear to be in a suitable environment during any period of its growth, and the result was practically a failure. It was also sown upon the uplands of the farm, where the contrast with cowpea was even greater.

The conditions during the past summer were much cooler than usual, and the period between last spring and early autumn frosts shorter ; consequently many of the summer crops failed to mature seed. It is highly probable that Guar requires a much longer and warmer season than obtains here.—R. W. PEACOCK, Manager.

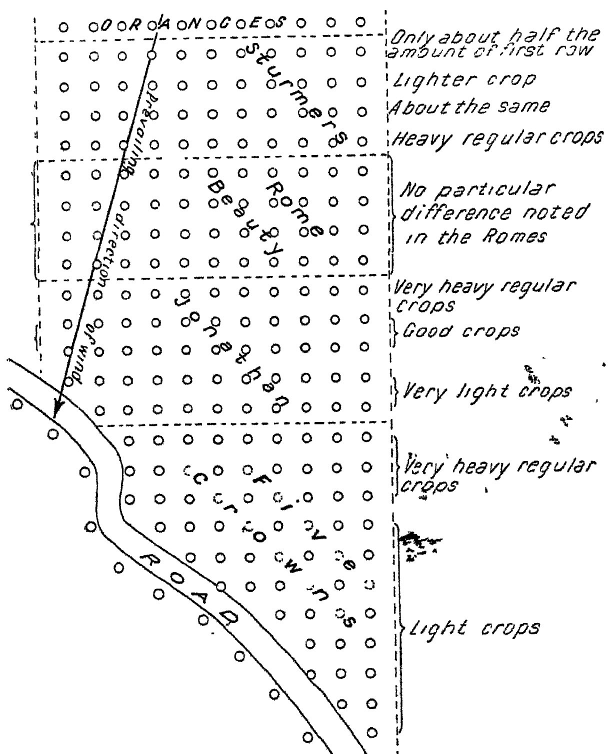
At Grafton, seed sown in March did not succeed. A spring sowing is being made. Reports are not yet to hand from the other Farms.

Inter-pollination of Apples.

W. J. ALLEN.

THERE is very little positive knowledge concerning the inter-pollination of fruits, and no subject in pomology is in greater need of study. We know that the most productive orchards are usually those of many varieties, and that some varieties refuse to fertilise themselves. The safest practice, therefore, is to plant only a few rows, say, three or four, of any one variety together, in fruits in which (like many apples and pears) sterility is often apparent. Bailey points out that self-sterility may be due to unisexual flowers, or to the pollen being impotent upon the pistils of the same flower, and that varieties may sometimes be self-fertile and at other times self-sterile.

Several orchardists at Mount Irvine, Blue Mountains, have been kind enough to furnish me with plans of their apple orchards, and notes upon the productivity of the trees. Sketches have been made from the plans, and the notes made by the owners are given alongside the rows.



Inter-pollination of Apples.
Plan of Mr. Scrivener's orchard.

Mr. C. P. Scrivener, in forwarding plan of his orchard, says :—

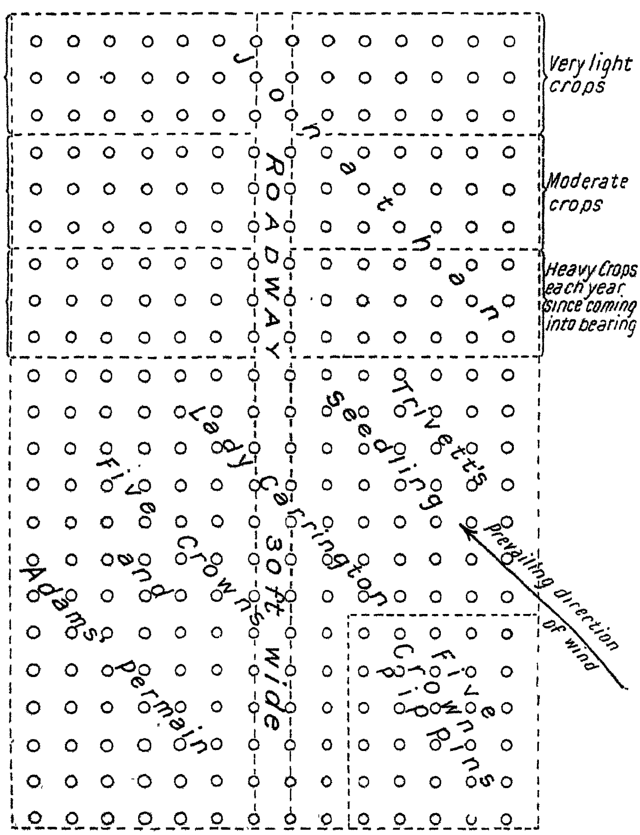
The trees are all planted in blocks, viz., 68 Sturmers ; then four rows of Rome Beauties, 58 in all ; then 68 Jonathans ; then Five Crowns. The Sturmers and Jonathans flower at the same time, and the late Jonathan bloom is out when the Five Crowns come into bloom. The Rome Beauties bloom at about the same time as the Five Crowns.

The Sturmers nearest the Jonathans have always given the best crops, and each row has given lighter crops until the back row, which on an average has given about half the amount of fruit given by the row nearest the Jonathans.

The Jonathans nearest the Sturmers have also given heavy crops, gradually becoming lighter until those farthest away have only averaged about a case per tree. The heavy croppers give up to nine cases, and have averaged about four cases since starting to bear. The row nearest the Five Crowns crops practically only on the side next to Five Crowns, the other side of the tree being almost bare of fruit.

The Five Crowns nearest the Jonathans, and for three rows below them, give heavy regular crops, averaging about six cases per tree. The other trees give only about two cases per tree.

I think that if they were more bees here the difference in cross-fertilisation would probably not be so marked. The wind seems to be responsible for carrying the pollen, as the row of Jonathans near the Five Crowns is only fertilised on the side nearest them, whilst the Five Crowns seem to be affected three rows away. They are to the lee side of the Jonathans. In my orchard the soil is practically the same throughout.



Inter-pollination of Apples.

Plan of Mr. Mathews' orchard.

The other plan shown is that of Mr. Mathews' orchard, also supplied by Mr. Scrivener, who says:—

The Jonathans are the only trees planted in a block, and in this block there are 117 trees. There are also four trees mixed in with the main orchard. These four trees, although small, bear regular crops every year of about four cases per tree. The main block fruits heavily where the rows adjoin the other trees, gradually getting lighter until the outside row is reached, where the trees bear only about a case per tree. On the side nearest the other trees the block gives up to seven cases per tree, the average being five cases.

In another block, where Jonathan and Cleopatra trees are mixed, the trees are just coming into bearing, and gave an average last season of a little over two cases per tree.

There seems to be no difference in the amount of bloom on the trees bearing heavy crops and those only having a case of fruit. Naturally the trees that have had heavy crops have not grown quite as large as those with light crops.

Mr. H. B. Morley has also sent me a plan of his orchard, planted out eleven years ago, showing very similar results. He says:—

Five Crowns planted in block cropped only on the rows alongside the next variety, and the trees completely surrounded by other varieties, bore the heaviest and most regular crops.

The influence of the prevailing winds can be seen in the fact that the leeward side of the orchard bore regular crops. I have re-worked a great many of my Five Crowns with Jonathan (and occasional trees of Cleopatra for cross-fertilisation purposes), but regret having done so, as I am sure that if occasional trees had been re-worked, they would have cross-fertilised the main body of Five Crowns, which, from need of cross-fertilisation, had borne nothing previously. No doubt an overwhelming number of bees would help very much in cross-fertilisation.

Use of Explosives in Preparing Land for Fruit-trees.

Mr. J. Wren, manager of Towrie Estate, Maryvale, has just prepared land for fruit-trees, using gelignite for breaking up the subsoil. The position is a gravelly ridge, the soil being red volcanic, with a heavy red clay subsoil. The surface soil was removed to a depth of about 1 foot, over an area 4 feet in diameter, in the position where the tree was to be planted. A hole was then jumped 3 feet deep with a bar, and five plugs of gelignite were placed in the hole and exploded.

On digging out a hole to see how deep and wide the soil had been disturbed, it was found that it had been lifted to a depth of 7 feet from the surface, and a width of 6 feet. One man averaged six holes per day by this method; the cost for gelignite, fuse, caps, and man's wages being 2s. per hole. By the ordinary method of trenching, the work would have cost twice as much.

The rainfall in this particular locality is 20 inches per annum; so that, with the soil loosened to this depth, there is no likelihood of stagnant water lying in the hole.—Mark H. Reynolds, Inspector of Agriculture.

Protecting Young Fruit-trees from Hares.

I have tried several methods but have never found anything equal to paper. Whitewash of any kind has to be renewed after every shower of rain, but by placing a piece of paper the length of the stem of the tree, wide enough to go round twice and tied lightly, top, bottom, and middle, you have a protection that will last the season.—W. E. Henderson, Singleton.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

Cultivation.

THE most important work for this time of the year is cultivation. If neglected at this particular season there is very little hope of harvesting crops of fruit which will be payable. Cultivation is the one work which cannot be neglected, and without which no grower can hope to succeed. I would, therefore, urge on all our growers the necessity of keeping their land well worked up to a good depth, and under no consideration leave the ploughing too late in the spring, as during most seasons we require all the moisture which we can possibly conserve, in order to keep the tree in a healthy and growing condition, so that in its turn it may be able to supply the fruit with the required nourishment to bring it to maturity; therefore, work the land well in the early spring, and from that time see that it is kept loose by constant cultivation.

Summer Pruning.

Summer pruning may be started this month, and it is well to go over and regulate the growth of all young trees, thinning and shortening back where required—that is, where the tree is growing too thick—and pruning or pinching back so as to keep the tree evenly balanced and symmetrical. This early summer pruning is more for young trees—to aid in directing the growth to that part of the tree where it is most required.

Codlin Moth.

The orchard should be kept free of any rubbish which will harbour the codlin moth, and the bandages placed around the stem of the tree to catch the grubs of same should be removed every seven to eight days, and all grubs killed. It is most important that all fallen fruit should be picked up and destroyed regularly. Continue spraying with arsenate of lead for codlin moth.

Harvesting.

The harvesting of the orange and lemon crop will be about completed this month. Early apricots, peaches, and cherries will commence. See that all are well graded, and put up in the most attractive manner. Neither apricots nor peaches should be allowed to become over-ripe before being marketed. As a matter of fact, they should be picked on the green side, as it is usually a few days before they reach the consumer, after they leave the orchard, by which time they are in about right condition for use.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Bathurst	Mr. S. McKibbin, O'Connell.
Bonville	Mr. H. B. Faviell, Bonville.
Carlingford	Mr. D. K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Frogmore	Mr. W. Thompson, Forest Creek, Frogmore.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla ...	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Lawrence ...	Mr. E. T. Cooney, Lawrence.
Milbrulong	Mr. O. Ludwig.
Nelson's Plains ...	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes...	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings

should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

Co-operation.

One of the most important questions that should be engaging the attention of all producers, is that of co-operation, which merely means combining for the common good. The great benefits that have been derived by those who have already identified themselves with co-operative concerns—and the numerous co-operative butter factories are familiar examples in this State—should be sufficient to encourage others to work on similar lines. It is the desire of the Department to encourage co-operative effort, and the branches of the Agricultural Bureau are invited to set apart an early meeting for the purpose of discussing the matter generally, and ascertaining, in particular, the best method of applying the system to local requirements.

To guide the branches of the Bureau, mention may be made of some of the purposes for which producers may co-operate. Co-operative butter factories are already an accomplished fact, but the principle is capable of further extension, especially to bacon, cheese, and eggs. Egg-selling societies in Europe collect the eggs from local centres, and forward them to a central depôt where they are graded and sold. There is scope for organisation on a small scale in many a scattered district, where farmers will not bother to send a few eggs to market for their collection and despatch to the metropolis. In South Australia more than a quarter of the exportable wheat is handled by a Co-operative Union. In addition to co-operative selling, the principle is extended to the purchase of materials, manures, machinery, and seed. More advantageous terms can be obtained from manufacturers and agents, and concessions obtained in freight. Farmers could band together for the joint ownership of labour-saving machinery and stud stock, for herd-testing, and for insurance, and would be able to obtain concessions as a body which they—as individuals—would never procure.

Many difficulties will, of course, have to be overcome, but they are not insurmountable, and the deliberations of the branches of the Bureau may result in practical benefits to the agriculturists of the State. The first requisite in each district is the presence of the true spirit of co-operation in a few cautious, brainy men, who will inspire confidence in their neighbours, and who will *freely* give their enthusiastic help and business experience during the critical stages of the movement's infancy.

Notice to Hon. Secretaries.

The branches have been asked to advise the Department the dates of their regular monthly meetings, but in many cases this has not been done. The Yass Branch thinks it would be a convenience to Hon. Secretaries communicating with one another if the date and time of meetings were known. Will Hon. Secretaries please forward the requisite information.

Bonville.

The first meeting of this branch was held on the 13th September, when officers were elected; nineteen members have joined the branch.

Mr. Palgrave, Veterinary Officer of the Stock Branch, read a paper on "Contagious Abortion and Mammitis," and Mr. L. F. Uther read an instructive paper on "Winter Fodder suitable for the district."

Carlingford.

At the September meeting, Mr. H. Lord, Lecturer in Agriculture at the Sydney Technical College, delivered a lecture on "Underground drainage and lime in the Orchard."

Dubbo.

Nineteen members have joined this branch, and the following officers have been elected:—Chairman, Mr. W. W. Baird; Vice-Chairmen, Messrs. F. Weston, A. Craig, T. H. Matthews; Hon. Treasurer, G. A. Ball; Hon. Secretary, Mr. T. A. Nicholas, Dubbo.

Frogmore.

At the meeting on the 14th October, Mr. W. Thompson, the Honorary Secretary, read a paper on "Birds," after which an interesting discussion followed. A discussion also ensued on a circular from the Yass Branch of the Bureau relating to "Fly in Sheep."

Messrs. J. Carne and T. Sligar have been elected members.

Jiggi.

This branch has decided to purchase two (2) Babcock testing machines, one—4-bottle—for the use of the scholars at the Public School, and the other—12-bottle—for the use of the farmers, and arrangements are now being made for an officer of the Department to give the necessary instruction in their use.

Katoomba.

On the 13th October Mr. Max Henry, M.R.C.V.S., gave a lecture on "The Breeding and Care of Horses," illustrated by lantern views. The lecturer first considered the choice of the stallion, the desirability of using pure-bred sires being emphasized, and the nature of what are known as herditary unsoundnesses pointed out. The necessity of being at some trouble to pick out the most suitable stallion for any particular mare was noted, and then the life of the foal briefly traced, special attention being given to castration and the need for cleanliness in that operation urged. The question of feeding the working horse was considered, with special reference to colic, and some notice taken of errors in shoeing.

Little Plain.

The Sheep and Wool Expert, Mr. Mathews, proposes to give lectures and demonstrations to the members of the Little Plain Branch on the 9th November. He will give a demonstration on "Wool" in the afternoon of the former date, and in the evening a lantern lecture on "Sheep" will be delivered, in which the merits of the different breeds relative to their wool and mutton producing qualities will be dealt with. A second visit will be devoted to practical work amongst the sheep. Mr. Mathews will be prepared to spend the whole day in the district, and will be pleased to inspect members' sheep that have not been shorn, and give advice concerning them.

Messrs. W. R. Newport and G. Tucker have joined the branch.

Arrangements are being made for Inspectors McDonald and Pinn to lecture respectively on "Corn Growing" and "Potato Growing and Irish Blight."

At a recent meeting Mr. S. Leech read a paper on the "Cultivation of Corn," in which he advocated early ploughing and constant cultivation. He has found "Prairie Queen" the best variety for the district owing to its early maturity, as at Little Plain early frosts are not infrequent. One year Mr. Leech tried "Hawkesbury King," which he sowed in September. During summer it promised to be a splendid crop, the stalks 9 feet high, as big as a man's leg, and carrying tremendous cobs, but it was still green when the frosts set in and shrivelled it.

Lower Lawrence.

A branch has been formed at Lawrence with the abovenamed title, the first meeting of which was held on the 3rd October, when nineteen members joined. The following officers were elected:—Chairman, Mr. A. Johnson, senr.; Vice-Chairman, Mr. J. Cooney; Hon. Treasurer, Mr. H. Reeves, senr.; and Hon. Secretary, Mr. E. T. Cooney, of Lawrence.

Milbrulong.

Arrangements are being made for the delivery of a lecture by Mr. T. G. Palgrave, M.R.C.V.S., Veterinary Officer of the Stock Branch, on the 1st November, on "Diseases and Accidents of Stock."

Sackville.

A meeting of persons interested was held at Sackville on the 6th October, when Mr. J. G. R. Bryant, the Assistant to the Fruit Expert, delivered a lantern lecture on "Fruit Growing," and explained the objects of the Agricultural Bureau. As a result a branch was formed with twenty-three members, and the following officers were elected:—Chairman, Mr. J. Aspery, J.P.; Vice-Chairman, Mr. C. Kaiser; Hon. Secretary and Treasurer, Mr. C. H. Britten, of Sackville.

Stockinbingal.

Mr. T. G. Palgrave, M.R.C.V.S., Veterinary Officer of the Department, delivered an interesting lantern lecture on the 17th October, on "Diseases of Horses." There were about eighty persons present. The lecturer dealt chiefly with wounds, colic, and strangles, and explained fully the cause, symptoms, and treatment. A number of lantern pictures illustrating unsoundness in horses were also shown and explained.

Wagga Wagga.

At the meeting on the 7th October, Mr. G. McKeown, manager of Wagga Experiment Farm, delivered an instructive address to the members at the local School of Arts, on "Take-all and White-heads in Wheat," samples of which were shown. Mr. McKeown explained the fungus and how it attacked the cereal. He advocated the system of rotation or change to oat crops, and systematic fallowing of the land. A number of the members gave their experiences, and it was generally admitted that oat rotation and fallowing were the best remedial measures.

The subject for the meeting on the 21st October was "Noxious Weeds and Plants."

Walla Walla.

At a meeting of the branch held on the 16th September, a discussion took place on "Green Budding and Grafting on Vines," and in consequence thereof, arrangements are being made for the Superintendent (Mr. White) of the Howlong Viticultural Station to give a demonstration on this subject during December.

Wallendbeen.

Mr. H. Ross, Inspector of Agriculture, last month gave a lecture on "Wheat Growing," at which there was an excellent attendance.

The members of this branch visited Wagga Experiment Farm on the 18th October, when the manager explained the operations there in progress.

Walli.

Mr. Wyndham, the Poultry Expert at the Wagga Experiment Farm, delivered a lecture on the 27th September, to an audience numbering about forty. In the course of his lecture he dealt with the soil and site most suitable for poultry keeping, treatment of same to keep clean and healthy, the conditions of keeping birds in confinement as against allowing freedom, construction of houses and yards, space to be allowed, feeding for egg-production, and gave much information regarding the selection and feeding of breeding stock, the working of incubators, and also the breeding of turkeys.

Yass.

At the meeting held on the 16th September, Mr. T. Glover, of Bowning, gave his experience of an instrument for emasculation.

Messrs. W. T. Merriman and J. Burnett have been admitted as members.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

Black Aphis.—"H.D." (Eglinton): Apply lime-sulphur spray in the winter, when the trees are dormant. If the aphis appears in the spring, spray with tobacco wash. It must be clearly understood that two or more applications of spray may be necessary for black aphis. Leaflets giving formulæ have been posted.—J. G. R. Bryant.

Caterpillars (Cut-worms) Destroying Crops.—"W.T.J.": Poison them. In a green crop this may be done by spraying the crop with Paris green. If they are outside the crop paddock, spray the grass over which they are coming. They eat the poisoned plants and die. If they are in a standing crop, the whole field may be poisoned with bait; and this method can sometimes be used in a green crop, but it is more trouble than spraying. See *Agricultural Gazette*, March, 1907. (Miscellaneous Publication No. 1,069, copy of which has been posted.)—W. W. Froggatt.

Maize Smut.—"H.B." (Hastings River): From your description this is the ordinary maize smut. Remedies: (1) Avoid seed from smutted crops and districts; (2) treat the seed with a solution of 1 lb. copper sulphate (bluestone) in 5 gallons of water, immersing it until every grain is wetted—say, about 5 minutes; (3) collect all smutted parts of the plant and burn them; (4) rotation of crops tends to reduce maize smut.—Geo. Valder.

"White Rot" of Grape Vines.—"A.B." (Curra Creek): The grape root is affected by White Rot. This is a disease of the roots of grape vines, caused by various fungi. It is apt to develop in heavy and low-lying soils, not sufficiently drained. It is known by a whitish mould, seen on the bark just below the surface of the ground. The first thing to do is to drain the soil. Put 1 lb. of sulphate of iron (commonly called "green copperas") around the vine, 6 or 7 inches deep in the soil, within a radius of 12 inches from the stem. This should be done in winter, or early spring at latest. Next winter apply from ½ to 1 lb. of the material, and again the following winter. An additional treatment, which may also be given in winter or early spring, is to remove the soil round the collar of the vine, down to 5 or 6 inches deep. Remove the old bark, on which most likely the whitish mould that causes the disease is in evidence. Daub the exposed portion of the trunk with a solution made of 1 gallon of water, ¾ pint of sulphuric acid, and 5 lb. sulphate of iron. If there are old stumps or roots of trees in proximity to the vines, they should be removed, as they serve as a medium for breeding the fungi.—M. Blunno.

Summer Crops in Forbes District.—"H.S.": The principal summer crops for this district are maize, sorghums, cowpeas, and millets. Maize for grain should be sown in drills, using about 10 to 12 lb. of seed per acre; for forage, also sow in drills but more thickly, say, about 20 lb. per acre. Sorghum: Sow in drills, using from 7 to 10 lb. seed per acre. Millets can be sown either broadcast or in drills, using, say, 7 lb. in drills, and about 20 lb. broadcast. Cowpeas should also be sown in drills, using from 10 to 12 lb. seed per acre.—Geo. Valder.

Maize and Potatoes in Gunnedah District.—"F.M.B." (Somerton): In this district only quick-maturing varieties of maize should be sown. The best of these are Early Yellow Dent, Iowa Silvermine, and Pride of the North. It is, however, difficult to obtain pure seed of these at the present time. Samples of early varieties have been sent to you for trial. The best potatoes for late crops are Queen of the Valley and Coronation. The only fodder plant suitable for growing in this district during the early summer are maize, sorghums, millets, and cowpeas. Of these sorghum would probably give the highest yield of fodder, but care must be taken not to turn stock on to it until it is well in head and the seed is becoming hard.—Geo. Valder.

Checking Fermentation of Wine.—"J.D.": To stop a wine from working (*i.e.*, fermenting), it is necessary to add wine spirit so as to raise the spirit strength up to at least 30 per cent. proof strength. Any sugar contained in the wine is then sure to remain. Other questions answered by letter.—M. Blunno.

Feeding Motherless Lambs.—"H.C.": Very likely the lambs have been unable to assimilate the over supply of rich and too nutritive milk which you have probably given them. A good plan would be to serve the milk as it is obtained direct from the cow. Failing this it would be advisable to warm it slightly before giving it to the lambs. If it is considered too rich, dilute it with hot water. Feed till they are about three months old, when they should begin to pick for themselves, though even later feeding may be advantageous. Answered more fully by letter.—J. Wrenford Mathews.

Blood as Manure for Potatoes.—"H.J.B.": The wet blood from the slaughter yard would contain the same manurial ingredients as dried blood, the only difference being that the latter is less bulky, more concentrated, and easier to apply. Your suggestion, to mix it with vegetable matter and dry it in the sun, is a good one.—A. J. Pinn.

Department of Agriculture,
Sydney, 2nd November, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

JERSEY.—The Sphinx: sire, Calceolaria's Lad; dam, Sailor's Pride; calved 7th October, 1910; colour, fawn and white. Price, **£20.**

Sailor's Pride is from Egyptian Belle by Sir Jack. Egyptian Belle is from Egyptian Princess (imp.) by Tidy Punch, from Lady Tidy III, by Melbourne Punch.

WOLLONGBAR EXPERIMENT FARM.

GUERNSEY.—Lord Hopetoun: sire, Parson's Hope; dam, Souvenir of Wollongbar; calved 24th October, 1910. Price, **£45.**

JERSEY.—Maro: sire, First Choice; dam, Marjory Newman; calved 27th August, 1910. Price, **£20.**

BERRY STATE STUD FARM.

PURE-BRED GUERNSEY HEIFERS FOR SALE.

Name.	Sire.	Dam.	Date of Birth.	Price.
				£
Flaxy 3rd ...	Lord Clatford ...	Flaxy 2nd	17 August, 1910 ...	50
Venice	King of the Roses ...	Evening Star ...	16 October, 1910 ...	50
Music	Calm Prince ...	Hayes Musette 7th...	7 October, 1910 ...	50

Applications for these heifers will be held until 21st November. If more than one application for each be received, her disposal will be decided by ballot

The heifers will be sold only to farmers resident in New South Wales, and not more than one to any applicant.

H. C. L. ANDERSON,
Under Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ..	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy.	Grafton Farm ...	*
,, ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	1912.
Jersey ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
,, ..	Jamaica Jack ..	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
,, ..	Grenadin ...	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
Guernsey ...	Gentle Prince ..	Rose Prince (imp)	Gentle (imp.).	....	......
,, ...	The King's Mirror.	Calm Prince ..	Vivid (imp.)...	Casino	26 May, '12.
,, ...	Star Prince ...	Calm Prince ..	Vivid (imp.)...	Lismore	1 Feb., '12
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Palmer's Island ...	15 Jan., '12.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Casino	11 June, '12.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Feb., '12.
,, ...	Monsieur Beaucaire.	Calm Prince ...	Flaxy (imp.)	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius ...	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ...	Port Macquarie ...	20 Dec., '11.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Berry Farm ...	*
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Singleton	21 April, '12.
,, ...	Calm Prince ...	Rose Prince (imp.).	Gentle (imp.).	Berry Farm ...	*
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '12.
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
Ayrshire ...	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ...	*
,, ...	Jamie's Ayr ..	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	H.A. College, Richmond	*
,, ...	Julius Cæsar ...	Auchenbrain Spicy Jock (imp.)	Julia	Grafton Farm ...	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	H.A. College, Richmond	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th ..	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1911.

Society.	Secretary.	Date.
Lismore A. and I. Society	T M. Hewitt	Nov. 1, 2, 3
Tweed River A. Society (Murwillumbah)	A. E. Budd	„ 8, 9

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser	„ 17, 18
Kiama A. Association	R. Somerville	„ 26, 27
Wollongong A., H., and I. Association	M. A. O'Donnell	Feb. 1, 2, 3
Berry A. Association	C. W. Osborne	„ 7, 8
Moruya A. and P. Society	P. Flynn	„ 7, 8
Tumut A. and P. Association	T. E. Wilkinson	„ 13, 14
Shoalhaven A. and H. Association (Nowra)	H. Rauch	„ 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	„ 20, 21, 22
Central Cumberland A. and H. Society (Dural)	H. A. Best	„ 23, 24
Quirindi District P., A., and H. Association	G. Fowler	„ 27, 28, 29
Dapto A. and H. Society	J. H. Lindsay	„ 27, 28
Inverell P. and A. Association	J. McIlveen	„ 28–Mar. 2
Hawkesbury District A. Association (Windsor)	H. S. Johnson	„ 29 Mar. 1, 2
Bangalow A. and I. Society	W. H. Reading	„ 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	„ 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	„ 6, 7
Warialda P. and A. Association	A. J. Devine	„ 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	„ 7, 8
Nepean District A., H., and I. Society	P. J. Smith	„ 7, 8
Wauchope P., A., and H. Society	A. D. Suters	„ 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	„ 7, 8, 9
Oberon A., H., and P. Association	A. E. Bureher	„ 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	„ 12, 13, 14
Campbelltown A. Society	F. Sheather	„ 13, 14
Cobargo A., P., and H. Society	T. Kennelly	„ 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	„ 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	„ 13, 14, 15
Bowraville A. Association	C. Moseley	„ 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy	„ 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	„ 14, 15, 16
Gundagai P. and A. Society	A. Elworthy	„ 19, 20
Gloucester A., H., and P. Association	S. J. Bignell	„ 20, 21
Camden A., H., and I. Society	C. A. Thompson	„ 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly	„ 21, 22, 23
Moree P. and A. Society	D. E. Kirkby	„ 23, 24, 25
Blayney A. and P. Association	H. R. Woolley	„ 26, 27
Walcha P. and A. Association	J. N. Campbell	„ 26, 27
Molong P. and A. Association	W. J. Windred	„ 27
Cooma P. and A. Association	C. J. Walmsley	„ 27, 28
Yass P. and A. Association	W. Thomson	„ 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	„ 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	„ 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd	„ 28, 29, 30
Bathurst A., H., and P. Association	A. H. Newsham	April 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain	„ 17–20
Richmond River A., H., and P. Society (Casino)	D. S. Gayner	„ 23, 24, 25
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Clarence P. and A. Society (Grafton)	G. N. Small	„ 8, 9, 10
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 20, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	„ 27, 28
Young P. and A. Association	G. S. Whiteman	Sept. 10, 11, 12

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LARGE QUINCE FROM HENTY.

Grown by Mr. A. Rosler. Variety, Missouri Mammoth. (See *Gazette*, June, 1910, page 551.)
As the quince was too large for a Gazette page, portion only is shown.

VOL. XXII. PART 12. DECEMBER 2, 1911.

Agricultural Gazette of New South Wales.

Rust in Wheat and Oats, Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

Wheat Rust.

THE ravages of this disease have been responsible for very serious losses throughout the State in the past. During the last few years there has been no general visitation, and losses from this cause were confined to certain districts. Upon the return of seasons with rainfalls above the normal, it is only reasonable to suppose that there will be a repetition of the serious losses of the past, especially as such a rust-liable variety as Federation is gaining favour with farmers. The comparative immunity from this disease during the past decade has not conduced to caution in the choice of rust-resistant or rust-escaping varieties.

The conditions obtaining in some districts are more favourable for the disease than those of others; yet it must not be forgotten that no district can claim to be immune. The coastal districts suffer most severely from this trouble; so much so that wheat-growing from a grain point of view had to be abandoned. The question is an important one, nevertheless, for coastal farmers, as wheats for hay and green fodder are most desirable. The farms of the Eastern Tablelands, influenced by the moisture-laden easterly winds, are extremely liable to be visited by rust, and oats have largely taken the place of wheat in this section.

The Northern Tablelands, as a whole, are more seriously affected than the Central and Southern, on account of the heavier rainfall throughout the summer, and greater heat.

The wheat areas of the North-western slopes are very subject to this disease, and the question of rust-resistant wheats is ever an important one to the farmers of this area.

Throughout the Central-western and South-western slopes, which comprise by far the greater portion of the wheat belt, the trouble is of a more intermittent character, and depends upon conditions which may be termed abnormal rather than normal.

The production of rust-resistant or rust-escaping varieties is, therefore, most important, especially to ensure the expansion of the wheat areas in certain districts. This work of the wheat-breeder and selector has been much retarded by the uncertain behaviour of varieties when grown under conditions generally accepted as favouring the disease. One variety may, during one season, appear to resist the disease satisfactorily, whereas during

another it will be seriously affected. The result has been that many conflicting statements have been made regarding some varieties. This is in no small measure due to an insufficient knowledge of the factors or conditions favouring the disease.

It is universally admitted that moist and warm conditions prior to harvest are the principal factors favouring rustiness. It is considered that growing crops in situations where they are readily dried by winds and sun tends to check the disease. The wheat-breeder has also favoured the narrow and vertical leaves, rather than broader and more horizontal forms, which throw more shade and prevent rapid drying. Upon the assumption that conditions favouring rapid drying may check it, a thin stand of wheat from any cause should not be so badly affected as a thick one.

In practice the above theories appear to be sometimes rudely shaken. Rust works havoc in crops grown in exposed situations, and plants having the most room are attacked much more severely than those crowded together. From observations made by the writer, extending over many years, he is of opinion that there is an important factor which has been overlooked in the past, viz., a predisposition to attack induced by a too vigorous growth in the early stages. This early rank growth induces weakened tissues, which are disease-liable, and when followed by conditions favouring rust, such as heat and moisture during early summer, the disease is more virulent. It does not follow that an over vigorous early growth is indispensable to rustiness, but rather crops are more severely attacked when thus predisposed.

It would be interesting if this point of view were kept in mind by other observers. In districts favouring a very vigorous early growth, such as the North-western slopes, rust is prevalent. The feeding of this growth during the winter may prevent a crop being attacked. Soils which are over rich in plant-food induce a soft succulent growth, and crops upon such are frequently rusty. An isolated plant upon a headland may be much more rusty than one of the same variety growing in the main crop. This is probably due to the excess of plant-food and moisture at its disposal. A crop thinly sown in rows 14 inches apart was rusty, whereas the same variety sown 7 inches apart in similar soil and under similar conditions was free.

There are varieties of wheat which are practically rust-resistant, having the same season of development and habit of growth as others which are most rust-liable. The immunity is, in all probability, due to resistant tissues.

There are wheats which, on account of maturing before the summer conditions are favourable to the disease, may be termed rust-escaping and not rust resistant.

At this Farm during the past two years many varieties were grown upon the rich soil of the irrigation area in order to test their resistance to rust. They were irrigated several times to ensure very moist conditions during late growth and ripening. Incidentally their liability to lodge was also observed. The following are the results as regards their behaviour during 1909 and 1910:—

The letters attached to varieties of 1910 are abbreviations, and stand for the following:—S.W., stands well; S.F.W., stands fairly well; L., lodged; I.L., inclined to lodge.

SEASON 1909.

Very Rusty.	Rusty.	Slightly Rusty.	Rust-resistant.
Federation.	Thew.	Cleveland.	Power's Fife.
Bayah.	Dexter.	Sussex.	*Medeah.
Bunyip.	Warren.	Target.	*Cretan
Comeback.	Florence.	Genoa.	*Saragolla.
Bobs.	Yandilla King.	Tarragon.	
Early Jonathan.	Jonathan.	Russo-Barletta.	
Firbank.	Uppercut.		
	Cedar.		
	Rymer.		
	John Brown.		
	Dart's Imperial.		
	Whiteloaf.		
	Mudgee.		
	Australian Lammas.		
	Jumbuck.		
	Cowra White Lammas.		
	Marshall's No. 3.		

* Macaroni varieties.

SEASON 1910.

Very Rusty.	Rusty.	Slightly Rusty.	Rust-resistant.
Steinwedel, I L.	Cedar, I.L.	Cleveland, S.W.	*Huguenot, S.W.
Federation, S.W.	John Brown, S.F.W.	Genoa, S.F.W.	*Medeah, L.
Bayah, S.W.	Cowra White Lammas, S.F.W.	Florence, S.F.W.	*Cretan. L.
Bunyip, I.L.	Whiteloaf, I.L.	Jonathan, S.F.W.	*Saragolla, L.
Bobs, I.L.	Comeback, S.F.W.	Mudgee, S.F.W.	*Farrer's Durum, L.
Uppercut, I.L.		Warren, I.L.	*Velvet Don, L.
Firbank, I.L.		Dexter, S.F.W.	*Paros, L.
Jumbuck.		*Missogen.	*Sicilian Baart, L.
Dart's Imperial, I.L.		*Atlanti.	
Early Jonathan, S.F.W.		*Belotourka.	
Russo-Barletta, I.L.		*F.R.I.	
Little Club, L.			

* Macaroni varieties.

It will thus be seen that the majority of the bread wheats are rust-liable, and only one proved resistant, viz., Power's Fife, a Manitoban variety; also, that the majority of the macaroni wheats proved practically resistant, and the remainder were only slightly affected.

The condition induced by irrigating and sowing thinly in rows 18 inches apart favoured lodging. Their behaviour in this regard would not be so exaggerated when sown as in ordinary practice. A knowledge respecting the ability of a variety to stand during wet windy weather after heading is important when choosing varieties for districts such as the North-western slopes, where the land is rich and summer storms frequent.

Notes on Rust in Oats.

SEASON 1909.

Rusty.	Slightly Rusty.
Cape.	Peerless White Bonanza. Skinless.

SEASON 1910.

Rusty.	Very Slightly Rusty.	Practically Free.
Cape.	Algerian. Red Rust-proof. Bathurst Early.	Abundance. Carter's Royal Cluster. Surprise. Big Four. Stable King. Milan Market. White Horse.

As was before stated, oats may be grown satisfactorily under conditions unsuitable for the majority of wheats.

REPORTS FROM OTHER EXPERIMENT FARMS.

In order to afford readers the opportunity of seeing how the several varieties behave in other districts than Bathurst, the Experiments Supervision Committee directed that reports should be obtained from other Experiment Farms and published with Mr. Peacock's observations. The officers of Wagga, Cowra, and Glen Innes Farms classify the wheats grown there, in regard to rust-resistance, as follow :—

Wagga Experiment Farm.

Mr. McDiarmid, Experimentalist, supplies the following notes taken during growth in the stud wheat plots and variety trial 1910. The year was rather bad for rust in the plots :—

Very Rusty.		Rusty.		Slightly Rusty.	
Stud Plots.	Experiment Plots.	Stud Plots.	Experiment Plots.	Stud Plots.	Experiment Plots.
Bunyip. Bobs. Bayah. Federation. Zealand. Genoa. Jumbuck. Steinwedel. White Velvet.		Firbank. Marshall's No. 3. Plover. Jade. Rymer. Jonathan. Dart's Imperial. Allora Spring. Petatz Surprise. Majestic. Baroota Wonder.	Federation. Bayah. Bunyip. Marshall's No. 3	Florence. Thew. Comeback. Warren. John Brown. Cedar. Yandilla King. Gluya's Early.	*Comeback. *Cedar. *Warren. *John Brown. Rymer. Firbank. Zealand. Bobs. Florence.

* The most resistant of all in the variety trial.

In field crops, Bunyip has been very rusty on flag, but grain does not appear to have suffered in quality to any appreciable extent. Zealand, Federation, and Firbank may be classed as rusty (flag only), Marshall's No. 3 as only slightly rusty (flag only).

We do not consider that for many years we have suffered any appreciable loss of grain in field crops through rust at Wagga Farm, such rust as has appeared being slight, and affecting flag only.

G. M. McKeown, Manager.

Cowra Experiment Farm.

The wheats grown in the variety trials at this Farm may be classified with reference to rust-resistance as follows:—

Very Rusty.	Rusty.	Slightly Rusty.	Rust-resistant.
Steinwedel. Zealand. Federation.	Bayah. Bobs.	Bunyip. Comeback. Firbank. Florence. Genoa. Cedar.	Huguenot. Warren.

J. T. Pridham and F. Ditzell.

Glen Innes Experiment Farm.

Wheats that became very rusty are not carried beyond the stud variety trial. The wheats grown at the Farm may be classified as follows:—

Rusty.	Slightly Rusty.	Rust-resistant.
Comeback. Thew. Bayah.	Haynes' Blue-stem. Genoa. Warren. Jonathan. Cedar.	None.

R. H. Gennys, Manager.

Importation of a Ryeland Ram from New Zealand.

The "Ryeland" is a sheep about which little is known in Australia. It is one of the older British breeds, mentioned by Youatt as being an established breed in the latter part of the eighteenth century, and it has been largely used for crossing with other British breeds. In New Zealand it is reported to possess early maturing qualities, and to give a high class of mutton.

Through the courtesy of the New Zealand Department of Agriculture this Department has been able to obtain a ram-hogget of this breed from Mr. John Withell, South Canterbury. The animal arrived safely, and will be tested at Wagga Experiment Farm.

Government Farrer Scholarship.

The Minister of Agriculture (the Hon. J. L. Treflé) has approved of a Government Farrer Scholarship being offered for competition amongst students wishing to enter the Hawkesbury Agricultural College with a special view to studying the subject of wheat cultivation in its broadest sense.

The value of the scholarship will be £91, and it will provide for the full education of the recipient during the three years' course, for the purchase of books and apparatus, for the payment of sports fees, laundry charges, and the usual fee for doctor and medicines. There will thus be no obstacle for any lad, whatever his financial circumstances, entering for this scholarship with a view to his going still further at the end of his college course if he has the ability and the inclination.

The Trustees of the Farrer Memorial Fund are specially authorised to give priority in the matter of the Farrer Research Scholarship to a Government Farrer Scholar, at the close of his college course, if he shows special aptitude for research work in connection with wheat-cultivation, either in the University laboratories or in the field. It may thus happen that the lad who is selected to be the first Government Farrer Scholar may be taken in hand by the Trustees of the fund at the close of his college course, and enabled to do valuable research work in the State, and afterwards, perhaps, for a year in some laboratory in the Old Country or in America.

It will be an advantage if the successful candidate shall have matriculated before entering the college, so that he may be able to proceed to the University afterwards if he so desire.

Candidates are now invited to apply to the Under Secretary, Department of Agriculture, for competitive examination for this scholarship. Such examination will take place at the ordinary time fixed for the entrance examination to the college, in January or February next, and the subjects will be the same as those set for the entrance examination, as outlined in the prospectus.

The examiners will give special consideration to the candidates' aptitude for the special work of wheat cultivation, and it is hoped that there will be keen competition for this scholarship, the holding of which will certainly be an honour, and will ensure a good education at the college, and probably an extension afterwards.

Erratum.

On page 963 of November issue there is an illustration of a wheat-drill used at Bathurst Experiment Farm. The description should read, "Wheat-drill cut down to sow barley between the rows of maize" The matter is dealt with on page 964.

Farrer Research Scholarship.

THE money subscribed by the public to the Farrer Memorial Fund amounted to £1,030. The Farrer Memorial Committee have vested the money in five Trustees—Messrs. F. B. Guthrie, G. W. Walker, and Henry Lord, and two others to be appointed by the Government in virtue of its yearly subsidy. The Minister of Agriculture, upon the suggestion of the Committee, has appointed the Under Secretary of Agriculture and the Principal of the Hawkesbury Agricultural College *ex officio* as Trustees.

The Trustees are instructed to allocate the interest accruing from the fund in the form of a "Farrer Research Scholarship," the specific object of which is the improvement of wheat cultivation, using the term in its widest sense. Research is to proceed along definite lines, with the improvement of wheat as the specific object in view. The phrase is interpreted broadly, and includes the improvement of the plant or grain for a specific purpose, improvement in the treatment of soil or crops, and investigation having the further object of the advancement of our knowledge of the nature of the grain or its products, including flour and bread. The conduct of such investigation may include field work, laboratory work, work in the mill or bakehouse, or a combination of these. The following specific instances of the type of investigation which the Committee have in view may be mentioned:—

FIELD WORK—This may be carried out on one of the farms of the Department of Agriculture, or on a private farm or estate.

Cross-breeding and selection, in order to produce improved varieties with a specific object, such as prolificness or resistance to disease or drought, milling excellence, flour strength, nutritive qualities, &c., also improved methods of treatment of soil and crops.

LABORATORY WORK—This may be carried out, according to its nature, at one or more of the University laboratories, or at one or more of the Government Departmental laboratories.

(*a*) *Botanical*—Study of the structure of plants and grain or of different parts of same, germination, &c.

(*b*) *Microbiological*—Study of diseases and their remedies; study of fermentation in bread-making, &c.

(*c*) *Chemical*—Nature of the grain and of different varieties of grain; nature of flour and bread; nutritive value of bread; digestibility, &c.

Technical Work may be done in a mill or bakehouse apart from or in conjunction with laboratory work. Improvements in milling or baking operations tending to improvements in the quality of flour and bread.

The Committee suggest that a candidate suitable for the original work contemplated in this scheme will be found in one of the following types of applicants:—

(*a*) A graduate in Science who may desire to pursue his further studies with original research in Cambridge University Laboratory or elsewhere outside the State. The revenue from the Fund for two years may be given for one year's research in such a case.

(*b*) A graduate or undergraduate who wishes to pursue the study of plant-breeding in any specific direction in the University laboratories under the supervision of the Science Faculty.

(*c*) A student who has taken his diploma from the Hawkesbury Agricultural College, or who has done a satisfactory course in any similar institution, and who wishes to pursue the study of plant-breeding in the field or in any other way approved by the Trustees.

(*d*) A young farmer or other person who has the necessary qualifications and aptitude for investigating this subject in the field, and will do so under the supervision of the Trustees, and in accordance with their regulations.

The Trustees now publicly invite applications for this Research Scholarship, valued at ninety pounds (£90) per annum, for the year 1912, from persons possessing the qualifications mentioned in one of the above paragraphs. The selected scholar shall devote himself entirely to the prosecution of his specified work, and shall present his results at the close of the year's investigations in the form of a paper or monograph, which may be published by the Trustees. At the end of the year the holder of the Scholarship may be re-appointed, or a new selection made, according to the judgment of the Trustees.

Applications should be addressed to the Under Secretary, Department of Agriculture, Sydney, and will be received up to 20th December, 1911.

Depth of Ploughing in South Australia.

It seems that very shallow ploughing is not so universal in South Australia after all. At the Naracoorte Branch of the South Australian Agricultural Bureau, a long discussion was held upon this subject, following a paper read on 13th May by Mr. W. Loller. Members quoted several instances where deep ploughing, even as deeply as 10 inches, gave best results in comparative tests. On the other hand, one of the most successful wheat-growers in the district never ploughed land of any kind deeper than 2 inches or 2½ inches, and yet his average was over 20 bushels per acre on all soils. But he used the disc cultivator freely.

Mr. Loller quoted the case of a real good farmer at Barunga, who ploughed a light soil 4½ inches deep, turning up about 2 inches of clay. He got hardly any crop; and it was three years before he could make the soil show any improvement, by working it well at great cost. We hope none of our readers will repeat *that* experience on any large area.

The best depth to plough appears to vary greatly with the soil. Until exact scientific experiments can be conducted in a large number of districts, farmers commencing operations in a locality which is new to them, should follow the example of their most successful neighbours working similar soil.

"Caterpillar Pest" in Ganmain District.

WALTER W. FROGGATT, Government Entomologist.

In September, in response to the request of the Farmers and Settlers' Association at Ganmain, I visited the district, and spent three days with the secretary (Mr. J. D. McGrath) investigating the damage done by caterpillars to the local wheat crops.

This season the caterpillars have been attacking the wheat paddocks in isolated patches, but it has not been a general infestation, as in some years. It has, however, been widespread, as they have been reported from Yanco, Narrandera, and Grong Grong, as well as Ganmain. Mr. Whinrow has been one of the largest sufferers near Ganmain, and has had about 50 acres of a fine wheat crop eaten right down. He considers that the eggs were deposited upon the straw in the paddock after the last crop was harvested, and the area infested was that in which the straw had been ploughed into the ground. In the other part of the paddock, where the crop had been cut for hay, and where there was no straw to plough in, no caterpillars were found. Where an old road had crossed the cultivation paddock there was not a blade of the standing wheat eaten off, and it remained as a broad green ribbon across the denuded field, eaten close down on either margin. This might suggest that if the surface of the ground is firm and smooth the caterpillars would pass over it, looking out for open, cracked ground, in which they hide during a portion of the day, feeding chiefly at night. Both here and in other places examined the caterpillars were all buried under the clods, and had apparently nearly reached full growth; they would soon pupate and become chrysalids under the clods. The danger had passed, but from these chrysalids the perfect moths, short-winged, thick-set, dull brown insects, would emerge about midsummer. Each female is capable of laying several hundreds of eggs.

The pest appears, from the caterpillars examined, to be the Bugong moth (*Agrotis infusa*), or an allied species, which has been known as an agricultural plague from a very early date in New South Wales.

These caterpillars should be attacked as soon as ever they are first noticed in the crop. This year they appear to have bred out in the crop paddocks, and not come in from the grass lands, as is often the case. When small and hungry they are very easily poisoned, either by spraying over the ground upon which they are feeding, or spreading out poisoned baits, both of which are equally effective if carefully done.

Paris green is the most suitable poison for the purpose, and not so dangerous as white arsenic. One lb. of Paris green will poison 16 lb. of bran or sharps. The bran should be placed upon a sheet, and the Paris green

sprinkled over it, the whole being thoroughly mixed in a dry state. Sufficient water, to which a few pounds of salt have been added (to make it tasty), should be used to make the combined ingredients into a bran-mash that can be freely scattered with the hand over the infested ground when the caterpillars are feeding. They usually feed, in the warm weather, from 4 o'clock well into the night.

Spraying the infested patches of crop with fluid spray of Paris green—1 lb. to 100 gallons of water—will kill the caterpillars feeding upon the sprayed crop; but the mixture must be kept well shaken up, as the Paris green is otherwise liable to sink to the bottom, and the spraying would be uneven.

If Mr. Whinrow had advised the Department immediately, or poisoned the patches of caterpillar-infested crop as soon as the pests were noticed, I am sure that the greater part of his crop would have been saved. At one farm visited the owners had cut a regular irrigation channel right down between their crop paddocks, and, filling it with water, had with considerable labour kept the caterpillars in one corner of the field. Wherever the caterpillars were found they were followed by large flocks of ibis and countless numbers of wood-swallows (*Artamus superciliosus*), the latter settling in the crop and destroying the caterpillars, while the ibis confined their attention to the grass lands. If these birds had arrived earlier in the season they would probably have kept the caterpillars from doing any serious damage.

Butterflies Damaging Lucerne.

The Manager of Yanco Experiment Farm, Mr. F. G. Chomley, has forwarded specimens of a small blue butterfly to the Entomological Branch, with a statement that they were swarming over the irrigated lucerne. The Experimentalist reported on 18th May:—

> They have been flying about the lucerne paddocks since 1st March. They visited the Farm about the same time last year, when the larvæ (light green caterpillars, measuring from ⅜ to ⅝ of an inch in length) were so numerous that they averaged two to each stem of lucerne. They were destroying so much that the lucerne had to be cut on the 1st April. When the paddocks were subsequently irrigated, the waste water ditch was practically covered with the larvæ. The butterflies are still flying about, and resting on the lucerne leaves and flowers, but I have not noticed the caterpillars.

This butterfly is one of our smallest dainty "blues" (*Zizera labradus*), which has a wide range over Australia, and in its natural state lays its eggs upon lucerne, clover, and other allied plants upon which its larvæ feed. This is, however, the first record we have of its appearing in such numbers as to become a pest.

It is quite reasonable to suppose that, given large areas of land under lucerne, with such an abundant and permanent food supply, this little butterfly may become a serious pest that will have to be considered by the lucerne growers. It is very difficult to treat field crops like lucerne with sprays, but after cutting the paddock might be rolled or harrowed so as to destroy all the remaining larvæ and pupæ that might otherwise be ready for the fresh growth.—Walter W. Froggatt, Government Entomologist.

Milking Machines and Disease

MAX HENRY, M.R.C.V.S.

IN an article recently published by Mr. J. G. McMillan, Manager of Wollongbar Experiment Farm, entitled, "Machine *v.* Hand-Milking," page 859, October *Agricultural Gazette*, appears a short paragraph on the influence of the machine on the udder, partly from the point of view of disease, and it is to supplement that article in this connection that the following notes are written.

The writer has been watching the effects of machines closely for some years, more especially with regard to the same herd of which Mr. McMillan writes—that at Hawkesbury Agricultural College—in fact, was doing so in conjunction with him. Now there are various ways in which the machine is alleged to cause injury. First, it is charged with causing hæmorrhage; second, with causing mammitis, or inflammation of the udder; and third, with spreading contagious mammitis.

The first charge is well met by Mr. McMillan, and, indeed, no machine which caused such obvious injury could exist on the market at the present day. With regard to the second point, we must consider what mammitis is. Essentially it is an inflammation of the udder, but the causes which may lead to it are numerous, and common amongst them are bruising and wounding, overstocking, chill, and invasion by organisms, such as the tubercle bacillus or the streptococcus of mammitis; this invasion by organisms of some sort or other occurring in practically every instance of mammitis. Now there is nothing in the action of the well-constructed milking machine of the present day which can of itself bring about these causes; nor can the machine, if properly looked after, infect the udder with micro-organisms, and herein we come to the really serious charge made against the milking machine—that it spreads contagious mammitis—and there is no doubt that in the condition in which the milking machine is too frequently kept it will spread it. Nor is it difficult to understand the reason why this is so, and why in some cases it appears to spread the disease more rapidly than occurs in the case of hand-milking. In a herd milked by hand, the chief agents in the spread of the disease are the hands of the milkers, which, becoming moistened with infected milk while milking a diseased cow, are next used, without washing, to milk a healthy cow, often with disastrous results. Still the milkers' hands are washed occasionally, at all events between milkings, and they are used for many other purposes during the day, so that most of the infectious material is removed; but in the case of a machine cup which is allowed to remain in a dirty or partially-cleaned condition, there is not even that alleviation, and it remains a perfect breeding-ground for any organisms of the disease which may have been deposited upon it. In this way the dirty milking-machine cups are a very potent influence in spreading the disease.

What of the clean machine? We have no hesitation in saying that the clean machine will not spread the disease even as much as clean hands, and

our experience at the Hawkesbury Agricultural College was a very fine example of the fact; but it must be remembered that no cow with a defective udder or showing any lesion likely to be due to mammitis was, as far as possible, allowed to be milked by machine, and this is a point dairymen should bear in mind; for to deliberately milk a diseased cow with a machine, then to milk a healthy one, and blame the machine for spreading the disease if the healthy cow contracts it, is distinctly unfair. The blame is on the farmer for not keeping his diseased cows separate from his healthy herd. And yet one must qualify that to a certain extent, because there are many cases of contagious mammitis which are not obvious to the layman, but require some skill and knowledge in detection, and in any district in which contagious mammitis is present it would pay the farmer to have his herd examined by a qualified veterinarian with a view to putting out any suspicious cows. This applies not only in connection with machine-milking, for contagious mammitis is one of the most insidious and troublesome diseases a man can get into his herd. Nor is it an impracticable measure, as there are now qualified veterinarians practising in several of the more important dairying districts, and their number will certainly increase as time goes on.

Although we may say, then, that these diseases are not caused or spread by milking machines properly looked after, yet there is a condition found in the udders of cows due to machines built on defective principles. It is noticed that some few days after the milking machines are put on, the cows appear to be going off their milk and the udders are noticed to swell, become somewhat hard, hot, and painful; the cow objects to the machine being put on; and if the teat is examined after milking it will be seen that it has the appearance of having had a ligature round the top, so that the circulation of the blood has been stopped. If by way of experiment the thumb or finger is placed in the machine cup it will tend to become numb, swollen, and painful, owing to the continual suction and the pressure of the top ring of the cup.

Drastic treatment of the cow's udder is unnecessary, If the milking machines are discontinued and the udders bathed with warm water and gently rubbed with olive oil, they will come back to the normal, although the milk supply is likely to be lessened.

Now this affection can hardly be described as a mammitis, but is rather a condition of congestion; but there is little doubt that an udder so affected would present a very favourable field for the invasion of micro-organisms, and so an attack of mammitis might result.

This swelling is certainly due to the milking machine, but the best types of machine will not and cannot cause it, since it is due to two factors—a *continual* pressure and the presence of a metal ring at the top of the cup. The machine with an intermittent action, having air admission, would be incapable of causing such a congestion. In conclusion, we may say that the milking machine will not cause injury or disease, or spread disease, providing—

(1) That it is kept scrupulously *clean.*
(2) That is not used on diseased cows.
(3) That it is of the right type.

The Hydraulic Ram on the Farm.

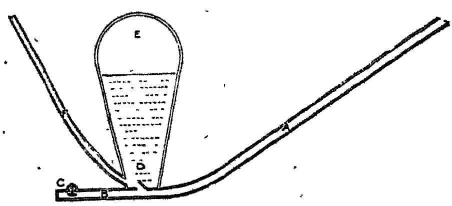
GEORGE MARKS, Inspector of Agriculture.

THE water supply, particularly on a dairy farm, is a very important matter, not only for the animal economy, but also as an aid in keeping the dairy premises clean and flushing drainage channels. Although the North Coast district enjoys a splendid rainfall, ranging from 60 to 100 inches per annum, there are times of the year when the water supplies attached to the homestead run short, and the necessary amounts have to be procured from neighbouring creeks or springs. When the daily requirements have to be thus obtained, a great deal of time and labour is involved.

In most of the hilly localities at the heads of the coastal rivers, and particularly in the volcanic Comboyne, Dorrigo, and Big Scrub districts, where almost every valley has its creek or spring, and where there is a fall of greater or less extent, a great deal of time and labour might be saved by the introduction of a simple but effective "water raiser"—the hydraulic ram. By its use not only could ample provision be made for the homestead supplies, but troughs could also be provided in neighbouring paddocks for stock use, thereby ensuring a pure supply, and helping very largely in keeping the sources pure. When stock have access to streams whose flow is very limited, there is always danger of pollution, and in too many instances the only water to which stock have access is in these polluted watercourses or lagoons. It is unnecessary to refer to this subject more than to emphasise the necessity of providing all classes of farm stock with the purest of drinking waters if they are to be kept in a healthy condition.

The hydraulic ram is a machine capable of raising water by itself to almost any height and distance. The only thing necessary is a fall or head of water. When properly adjusted, it requires no attention or oiling, and will work automatically day and night as long as there is an ample supply to feed it.

The accompanying sketch will serve to illustrate the working principles of the ram. Water from the reservoir enters the inlet pipe, A. Attached to this pipe is a dome-shaped cylinder containing air, with a valve opening inwards at D. At the extreme end of the inlet pipe is another valve, opening inwards, at C. The discharge pipe is shown at F.



The Hydraulic Ram.

The valve at C is weighted so that it will open when the water in the inlet pipe at B is at rest. To adjust this, the vertical height of the water

from the reservoir has to be taken into consideration. As the water enters it commences to flow out through the valve which is open at C. The force of this flow is sufficient to carry the valve up against its seat, and the momentum caused through this flowing column of water being suddenly checked is sufficient to open the valve D, through which a quantity enters until the pressure is relieved, when the valve C opens again, and valve D closes. Water again flows through the outlet valve C, when it is again closed and more water ascends through D. This action goes on repeatedly. The air in the dome-shaped cylinder is compressed, as shown at E, and this compression forces the water through the outlet pipe, F. The valves work automatically, being regulated by the flow and pressure of the water, and will continue to work without attention as long as the water supply is maintained in the reservoir and the machine is in good order.

By this machine a portion of the water that flows into the ram is forced through the delivery pipe, and can be raised to a considerable height—the height depending upon the head, and length and size of inlet and delivery pipes. The surface of the water in the reservoir should be kept constant, so that the pressure against the valve C shall be uniform. Any undue differences in the height of this supply will materially affect the working of this valve, and impair the efficiency of the ram.

The quantity of water a ram will deliver varies under different conditions, but it may be taken as a general rule that one-seventh part of the water which enters the ram can be raised and discharged four times as high as the fall applied. Thus a fall of 10 feet would raise 1 gallon out of every seven entering the ram 40 feet high, or half a gallon 80 feet high.

The inlet or drive pipe, A, leading from the supply in the reservoir, should be from 50 to 200 feet in length, according to the work required. It should also be three-fourths as long as the height the water has to be raised. For example, to force water to a vertical height of 100 feet, the drive pipe should be 75 feet in length.

The delivery pipe, F, may be almost any length horizontally, but should not be more than five to ten times higher than the fall applied to the ram. When there is a fall of, say, 10 feet, the vertical height of delivery pipe should be from 50 to 100 feet higher than the ram. The fall should, therefore, be from five to ten times less than the height to which the water has to be raised. If, for example, it is necessary to raise the water 100 feet high, the fall or head applied to the ram should be from 10 to 20 feet.

Rams will work successfully where the source or reservoir is only 3 feet above the ram. As the height or head increases, the more powerfully will the ram operate, and its ability to force water to a greater distance and elevation will correspondingly increase. Where, however, the requisite quantity is forthcoming from a ram under a certain head, it is not wise to increase this, for by so doing an extra strain is put upon the ram, those parts doing the work are unduly overtaxed, and the durability of the machine is thereby considerably lessened.

The weight of the volume of water in the inlet pipe is an important auxiliary in forcing water into the air-chamber and through the delivery pipes. When heavy lifts are required, the length of the inlet pipe may be advantageously increased, or where this is not practicable the pipe may be bent in a coil of 6 or 7 feet diameter.

The relative height of the spring or supply above the ram, and the height to which it is required to have it raised, determine the relative proportions between the water raised and wasted. The quantity raised also varies according to the height it is conveyed, and the distance the water has to be conducted. The consequent length of pipe will exert some influence on the quantity delivered at the point of discharge, as the greater the length of piping through which the water has to be forced, the more friction there is to overcome. When it is necessary to use elbows or make bends in the pipes, it is always advisable to have them as large as possible, so as not to interfere unduly with the free flow of the water. Any acute bends should be carefully avoided.

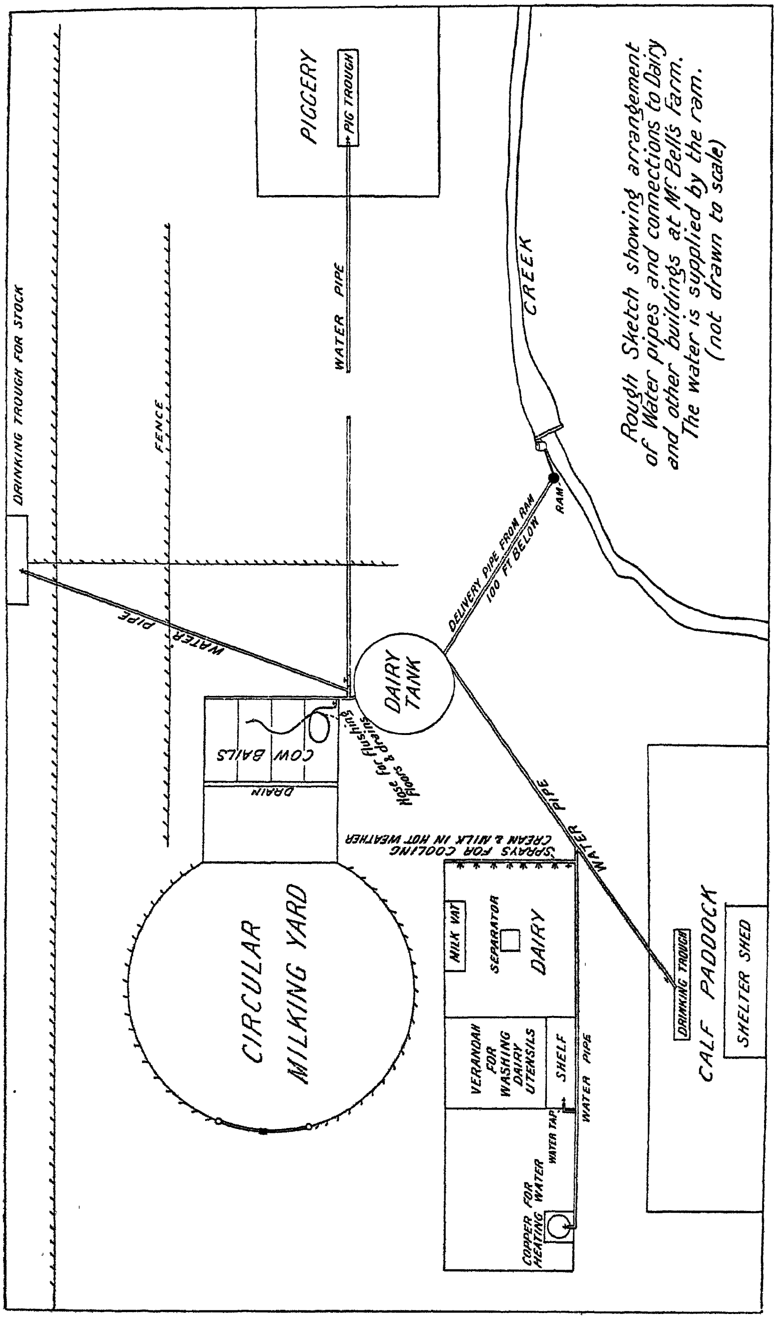
The size of the delivery pipe should always be much smaller than the inlet or feed pipe. For instance, a ram having a 2-inch diameter inlet pipe would require an inch delivery pipe ; a 4-inch pipe would require a 2-inch delivery; and so on.

In fixing a ram, it is always essential that it be set perfectly level, and firmly secured to solid wood, or preferably bolted to a concrete foundation. There is a constant concussion and strain upon the ram, and unless it is securely and properly set, it will speedily get out of position and render unsatisfactory service. In too many instances the ram is secured to a temporary support and held in position chiefly by the pipe connections, which in course of time invariably work out of position. In districts where frosts are prevalent, the ram and pipes should be carefully protected from frosts. The ram and source of supply should also be fenced off, so that there will be no pollution from stock, nor connections interfered with from the same cause. At the end of the inlet pipe a strainer should be fitted, so as to prevent access of any rubbish or leaves that would interfere with the working of the ram. A suitable race is also required for the free get-away of the waste water from the ram.

Its Value on the Dairy Farm.

The following is a brief description of a ram that has been in use for some considerable length of time on the farm of Mr. C. S. Bell, of Mount Pleasant, Tweed River :—

Mr. Bell's farm is situated some few miles from the town of Murwillumbah, on one of the slopes of the Macpherson Range. It consists of rich volcanic soil. In one of the gullies, not far from the homestead, is a beautiful spring of the purest of waters, which flows continuously throughout the year. In a suitable position a little reservoir was made by building a concrete wall across a narrow neck. This was done in order to receive an adequate supply in the dry months of the year. From this miniature dam the water is



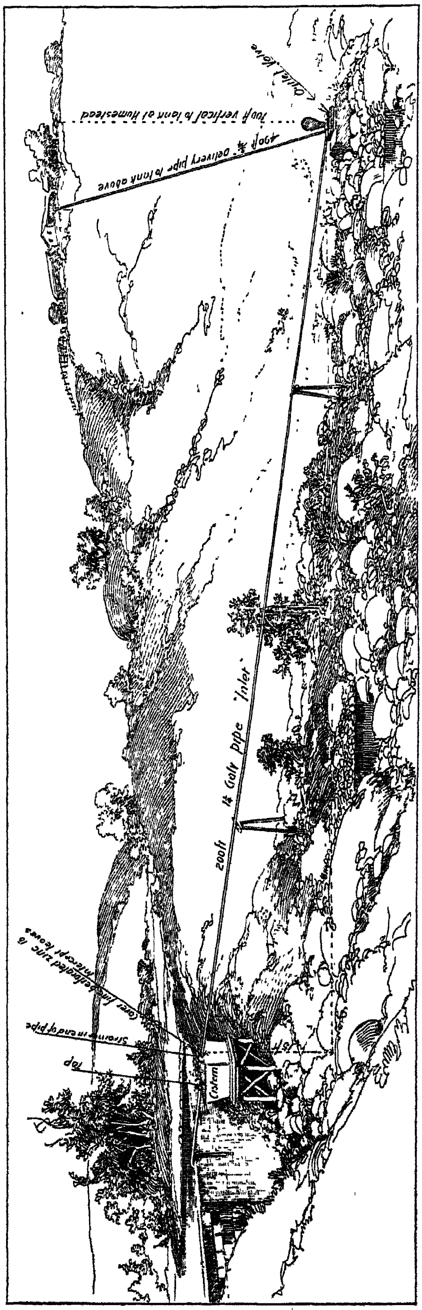
The Hydraulic Ram.

Arrangement of Water Supply at Mr. C. S. Bell's Farm, Tweed River.

conveyed through a length of pipe to a cistern, which is covered with fine perforated zinc to exclude rubbish. A tap is attached to the pipe, so that the supply can be cut off when cleaning operations are in progress or the ram is being overhauled. This cistern feeds the drive pipe, and is about 15 feet above the ram.

The drive pipe consists of galvanized piping, $1\frac{1}{4}$ inches in diameter, and is 200 feet long, with a strainer attached to the feed end. This pipe feeds a No. 4 ram, which is firmly attached to a heavy wooden base. The delivery pipe is $\frac{3}{4}$ in. piping, and about 490 feet long, the vertical height above the ram being 100 feet to the tank above. The ram delivers water to this height at the rate of 700 gallons per day.

By a sensible arrangement of pipes, the water from the central reservoir is distributed to the dairy buildings, cow-bails, calf and pig pens, and drinking troughs in adjacent paddocks. In the dairy a pipe is fitted with a series of fine jets, through which in hot muggy weather sprays of cool water play on to the cans of cream or milk, lowering the temperature, and consequently keeping the cream or milk in a sweet condition. With concrete and cement floors and daily washings, the whole of the dairy premises are kept in a perfectly clean condition, and the waste is utilised in



The Hydraulic Ram. General arrangement.

Sketch showing location of ram and pipes, Mr. C. S. Bell's Farm, Tweed River.

irrigating some of the pastures lower down the slope. By a further extension an ample supply of water would be available for domestic use and for irrigation purposes in the garden and orchard.

Mr. Bell has found the ram to be a great saver of time and labour. This machine and fittings were supplied by Messrs. John Danks and Son, of Sydney. For the benefit of those who may be interested, I append a few figures, showing the sizes, capacities, and other details, which have been supplied by this firm as the result of actual tests made by them.

Size of Ram.	Fall.	Size of Drive Pipe.	Length of Drive Pipe.	Elevation.	Size of Discharge Pipe.	Length of Discharge Pipe.	Quantity of Water delivered in 24 hours.
No.	feet.	inches.	feet.	feet.	inches.	feet.	gallons.
4	27	$1\frac{1}{4}$	200	270	$\frac{3}{4}$	600	800
5	17	2	90	100	1	600	1,400
6	10	$2\frac{1}{2}$	60	70	$1\frac{1}{4}$	547	1,440
7	8	$2\frac{1}{2}$	135	35	$1\frac{1}{4}$	400	3,500
10	$6\frac{3}{8}$	4	135	$104\frac{3}{8}$	2	1,510	1,700

Where an extra large flow of water is required, such as would be necessary where irrigation is practised on a small scale, a battery of rams could be used. By this means a number of rams are installed, each working separately, their delivery pipes connected with one larger discharge pipe.

Harvesting Sisal.

The Department of Agriculture has received a criticism by Mr. H. L. Daniels, manager of the Fibre Department of the International Harvester Company of America, respecting the recommendations made in Departmental publications as to the harvesting of Sisal. It is represented that Mr. Daniels' department buys rather more than half of the world's entire crop of Sisal, so that his standing in the trade and many years of experience entitle his views to consideration. In an industry which is new to us, we are liable to make mistakes. Mr. Daniels' remarks are, therefore, published for the benefit of those who are taking up this new line:—

A careful reading of the pamphlet and the figures contained in it satisfies me that they are handling these fibre plants very badly. There never should be so many leaves cut at one time, and the plant should never be cut so as to leave only a few leaves in the centre.

In Yucatan they figure that a leaf should become almost horizontal before being cut. Never under any circumstances should a leaf be cut unless the angle is at least $22\frac{1}{2}$ degrees, and they should wait until they are more nearly horizontal than that angle would indicate.

Never in Yucatan are more than eight or ten leaves cut at any one time. They usually gather leaves from a plant twice, and some even gather three or four times during the year.

Under these conditions the plant will live much longer, and will not throw out the pole and flower as quickly as will be the case where the plants are handled as indicated in the booklet sent to me.

The Brazilian Stink Grass.

(*Melinis minutiflora*, Beauv.)

A Probably Useful Grass for New South Wales.

J. H. MAIDEN,
Government Botanist, and Director, Botanic Gardens, Sydney.

In the year 1899 the Director of Agriculture forwarded to me a small bag of seed, together with some leafy specimens (without roots) of a grass which had been received through the Secretary of State for the Colonies. The following is copy of a letter which accompanied the specimens:—

British Consulate-General, Rio, 1 July, 1899.

The Marquis of Salisbury, K.G., &c., &c., &c.

My Lord,

Mr. Lewis Zumbuhe, residing at Estacao S. Bernado, in the State of Rio de Janeiro, lately brought to my notice a kind of grass which he describes as Brazilian "Stink Grass," and which he asserts possesses qualities which render it highly valuable for grazing purposes and fodder.

In the opinion of Mr. Zumbuhe, it yields more food than any grass that is cultivated, fully five times as much as common sheep fescue; and he states that it stands very close grazing and drought better than any grass known to him. He adds that it can also be cut for green or dry fodder, but if so treated this must be done before the seed heads show themselves.

It appears that there are two kinds of "Stink Grass," violet and white; the former is quite a permanent plant, but the white dies away within a few years. The violet, in fact, displaces the white sort, as one plant of the former will, within two years, cover several square yards.

As Mr. Zumbuhe believes that the grass would prove a valuable acquisition in Australia, particularly in Queensland, New South Wales, and Western Australia, he has sent a sample of the seed and a small quantity of grass, of second cutting, in the hope that it may be brought to the notice of those colonies.

These specimens, which I have the honor to forward herewith, are a mixture of both kinds, and in a few weeks I hope, by Mr. Zumbühe's courtesy, to be able to supply a sample of pure violet seed taken on his own pasture ground.

I have, &c.,
WM. GEO. WAGSTAFF.

I sent some specimens to the Director of Kew, and in due course obtained the following letter from Dr. Stapf, through the Director:—

Brazilian Stink Grass, communicated by J. H. Maiden. This is *Melinis minutiflora*, Beauv. (*Panicum Melinis*, Trin.; Doell in Martius, Fl. Bras. II, ii, 241, t. 33), a common Brazilian grass, known as "Capim mellado," or "Capim gordura." Doell says (*l.c.* 242) of the grass as a fodder plant:—*Pabulum equis bubusque maxime exoptatum illos vero (fortasse propter caryopsin deciduam) non bene nutriens.* The colour of the panicle varies from greenish-white to violet or purple, but I am not aware that this difference in colour is connected with any difference in structure or duration, as is suggested in Mr. W. G. Wagstaff's letter.

Otto Stapf, 1/1/1900.

Gardiner says on label of Kew specimen:—

2–4 feet high. Uplands. Cattle are fond of it, but it is said not to be nutritious.

Auguste St. Hilaire, in "Aperc. Voy," 1823, pp. 8 and 9, says :—

Le capim gordura engraisse les chevaux et les bestiaux, mais leur donne peu du vigeur.

These two extracts speak unfavourably of it, as not being a nutritious grass.

The following interesting report was then published in the *Kew Bulletin* :—

Brazilian Stink Grass.—A grass sent under this name to the Botanic Gardens, Sydney, and recommended, from the repute it has in Brazil, for cultivation in Australia, proves to be *Melinis minutiflora*, Beauv.

This species is common in Brazil, where it is said rapidly to take possession of land newly cleared of forest. In Africa it is found from the south of the Sahara to Natal, and it occurs in Madagascar. Its Portuguese names in Brazil, "Capim mellado" and "Capim gordura," mean "honey grass" and "fat grass," and there horses and cattle greedily seek it and fatten ; but, adds St. Hilaire (*Apercu d'un Voyage dans l'interieur du Bresil*, p. 8), they acquire little vigour. Gardner's testimony is to the same effect ; and Doell (in Martius, *Flora brasiliensis*, ii, pt. 2, 242) repeats the statement, adding that possibly the deciduous spikelets are the cause. This is in agreement with the statement contained in the report by H.M.'s Consul-General at Rio, that "it can be cut for green or dry fodder, but, if so treated, this must be done before the seed-heads show themselves."

In the coffee-growing districts of Brazil, Capim mellado is often sown to stifle certain weeds ; so thickly does it mat on the surface that the most stubborn of them—*Anatherum bicorne*—is ousted (*see* Van Delden Laerne, Brazil and Java ; Reports of Coffee-culture, London, 1885, p. 26).

How it grows in these districts Sir Charles Bunbury has described (*Botanical Fragments*, London, 1883, p. 103). "There are two plants," he writes, "which by their extraordinary abundance, and by the way in which they domineer over the rest of the vegetation, cannot fail to force themselves on one's attention. One is the large Brake (*Pteris arachnoidea*, Kaulf.) ; the other a small grass, Capim mellado. The herbage of the latter is thickly clothed with soft clammy hairs, giving a greyish tinge to the green ; the flowers, by their enormous abundance at the time of which I speak, gave a reddish hue to the whole surface of the lower hills. The way in which this grass covers the ground continuously for leagues together, to the exclusion of everything else, is very extraordinary. Auguste de St. Hilaire gives a curious account of the way in which it invaded the province of Minas, spreading farther and farther wherever the woods were cut down and burned, and smothering all the smaller and weaker plants till it reigned alone over extensive tracts. I saw little of it in the 'natural' campos to the south of Ouro Preto ; it seemed (as St. Hilaire remarked) to establish itself only where the soil had been stripped of its previous clothing of wood."

Two forms, differing in the colour of the spikelets and in duration, are said to exist ; of these, that with violet is preferred to that with pallid spikelets. The violet form, in fact, replaces the pallid when the two are sown together.—KEW BULLETIN, 1900, p. 31.

I caused the seed to be sown in the Botanic Gardens, and other places under my control, and sent it to correspondents in various districts in New South Wales.

It has flourished at the Hawkesbury Agricultural College and at Wollongbar and Grafton. Mr. Valder, the Superintendent, and Chief Inspector of the Department of Agriculture, has interested himself in the grass, and has been instrumental in procuring the following statement from the Manager of the Grafton Experiment Farm :—

Seed was first sown in the plots on 4th February, 1909, and grew well and looked very promising. I therefore sowed about ¼ acre to test its grazing qualities, but it came up very patchy. The seeds are very small.

This is the most promising grass yet tried at Grafton Farm. It grows prolifically ; but as yet I know nothing of its feeding value. It is somewhat similar to Summer Grass in

MELINIS MINUTIFLORA, Beauv.

1. A single spikelet.
2. Empty outer glumes of a spikelet.
3. Fruiting glumes of a spikelet, with ovarium.

appearance. It grows very long, and is a creeping grass, rooting at the joints like couch. Judging from appearances it would need to be kept well eaten down; to let it grow and then turn stock in would ruin it.

Another small area will be planted out during the coming summer. It will probably do better when sown at that season of the year.—A. H. HAYWOOD, Manager.

A botanical description of the grass is now given :—

Melinis minutiflora (Beauv. Agrost. 54 t. xi, f. 4), var. *pilosa* (Stapf); perennial or annual (?); culms 1-3 feet high, more or less hirsute except at the upper nodes; leaves loosely hirsute to tomentose; sheaths tight, terete, striate, finely tubercled; blades linear to linear-lanceolate, long, tapering to a very fine point; 2-6 inches by 2½–4½ lines, rather rigid, flat or involute; panicle linear to linear-oblong, contracted or almost spike-like, 4-8 inches long, erect, stiff or rather flexuous; rhachis slender, angular, smooth below; branches 2-nate, or the lower in scanty fascicles, erect, up to 3 inches long, distantly and repeatedly divided from the base; branchlets and pedicels capillary, flexuous, puberulous, the latter very unequal, up to almost 2 lines long, with or without white, stiff, fine hairs below the tips; spikelets 1 line long, very minutely bearded at base: lower glume very minute, oblong, obtuse, nerveless, upper equalling the spikelet, linear-oblong, like the lower valve, more or less hairy above the base, hairs white, very fine, awn of the lower valve very slender, scaberulous, up to 4 lines long, male floret ¾ line long, glabrous; anthers, ½ line long.

Eastern region; Natal, near Umpumulo Hills, 2,000-2,500 feet; *Buchanan*, 299.

Also in Nyassaland, and on Mount Ruwenzori.

The typical form, which is very common in Brazil, and occurs also in tropical Africa and Madagascar, only differs in being completely glabrous, and in the occasional absence of awns.—(*Flora Capensis*, Vol. VII, p. 447.)

Now, as to its botanical name.

It was determined by Dr. Otto Stapf, of Kew, as *Melinis minutiflora*, Beauv.

Dr. Stapf has recently described a variety *pilosa* (hairy), and says that the typical form, very common in Brazil and elsewhere, differs in being completely glabrous. The var. *pilosa* is figured by Medley Wood, at Plate 182 of his Natal Plants (Grasses), although the hairiness is not well brought out in the plate.

All the specimens in the National Herbarium, Sydney Botanic Gardens, belong to the hairy form. They include the specimens already referred to by me as having been received from Brazil in 1899, and another Brazilian specimen, collected by José Barbosa, and communicated to Herr A. Kneucker by Professor A. Usteri; also a specimen from Java, received from Kew early in 1899, together with specimens grown in New South Wales.

It will be noticed that Mr. Wagstaff, in sending the seed from Brazil, in the first place, speaks of two kinds, and it is possible that one of the kinds is the glabrous (non-hairy), or typical form of the grass.

Synonyms.—This grass bears also the following names: *Panicum melinis*, Trin.; *Suardia picta*, Schrank; and *Tristegis glutinosa*, Nees.

Vernacular Names.—It goes by the name of "Brazilian Stink Grass," because of its rather heavy, tobacco-like smell, and such a name must greatly militate against its popularity. In Brazil it is called "Capim gordura" and "Capim mellado," as already stated, on account of its glutinous properties.

In the Botanic Gardens, it is a grass 2–2½ feet high, and, rooting at the joints, it covers a large area of ground speedily.

Its real value to New South Wales remains to be further ascertained.

Maize.

A. H. E. McDONALD. Inspector of Agriculture, North-west District.

INTRODUCTION.

No other plant cultivated by man appeals so strongly to the imagination as maize. The majestic stems, the broad dark-green leaves, the nodding tassels the soft silk of the cob, and the rich grain that looks like drops of gold, have a fascinating effect which is peculiarly their own. It is the giant of cereals. The bountiful yields correspond with the magnificence of its growth. Over 100 bushels per acre are not uncommon, while it is known on indisputable authority that considerably over 200 bushels have been taken from a single acre.

Maize is one of the gifts of the New World to mankind. Some attempts have been made to show that it is a native of Asia, but substantial proof has not been forthcoming, and all the evidence points to its being a native of America. At the time of the discovery of that continent it was one of the staple foods of the Indians, and was found planted around their habitations. To the early settlers it was a God-sent boon, and since then, not only has it played an important part in the settlement of the country, but has contributed more to its wealth and prosperity than any other product. According to the latest estimate of the United States Department of Agriculture the production in U.S.A. is the enormous quantity of 2,668,651,000 bushels.

In Australia we are accustomed to regard our maize crop as of considerable importance, but the total quantity of a little under 9,000,000 bushels sinks into insignificance when compared with the American figures. We have not yet realised the importance of the crop, nor the uses to which it may be put. In a word, it may be said that our maize-farming has not developed to the standard which it has reached in America. There practically all the maize which is grown is converted into beef or pork, and leaves the farms in that form. Here we grow maize almost solely for the purpose of selling it to those who require it for horse-feed. Its value as a food for fattening stock has not yet been realised; or rather we have not realised the advantage of turning feeds into beef, pork, or mutton on the farm. This can only come with time. The fattening of stock is a highly technical process; and, speaking collectively, the knowledge and skill can only be acquired gradually. The high excellence of the American system is the result of years of growth, and we cannot expect to attain to it in a day. In our farming experience, we are, figuratively speaking, only now emerging from youth to manhood, and are only dimly perceiving the new paths which we must travel.

It is interesting to note that in the Argentine, where the conditions are as favourable as, if not more so than in the United States, for the growth of maize, and where the acreage sown to it is increasing, the crop is put practically to the same use as our own—namely, it is sold off the farm and the large surplus is exported to the European countries. No or few attempts are made to utilise it in the fattening of stock. The United States offer a marked contrast to this method of disposal. For instance, in 1902 the State of Iowa, which is one of the largest maize producers, exported only 32,745,642 bushels out of a total of 297,686,016 bushels, or about 11 per cent. of the total production. It would seem that only such grain as is not required on the farm for home consumption reaches the seaboard.

In our own State we have no definite system of utilising maize on the farm. Occasionally, when an exceptionally heavy crop is harvested and cannot be disposed of profitably, desultory attempts at fattening pigs are made, but often unsatisfactorily, due in part to the difficulty of securing the right class of animal for feeding.

Whilst it is to be regretted that we have not a good system of utilising our food products on the farm in producing the finished article of beef or pork, we have to consider whether it is profitable to grow a crop such as maize for grain rather than to utilise the land for dairying or other purposes. The right and proper function of the land is to grow those products which yield the greatest profit, and it would be the height of foolishness to work land without this as the guiding principle. It can hardly be questioned, however, that on the farms of the North and South Coast, where the conditions are so favourable alike to dairying and maize-growing, the cultivation of the latter crop for the sole purpose of utilising the grain in the fattening of pigs would not prove a most remunerative business and lead to greater profits being made from the land.

The figures contained in the accompanying tables, compiled by Mr. W. H. Cherry, Librarian and Statistical Clerk to the Department, are interesting as indicating the progress of the maize-growing industry. In 1909–10 it will be noted that a considerable increase occurred, but in the previous three years the acreage was actually less than in 1905–6. On the North Coast the area sown to maize is not increasing, while on the South Coast only a slight increase has been recorded. On the Tablelands the only pronounced progress has been made in the Central portion. On the North-western Slope the increase has been constant and important.

Statistics show that the area sown to maize and the quantity produced is but little more than it was twenty years ago. In 1891, in the County of Clarence, 24,000 acres were sown, while now the area is only a little more than 20,000 acres. At that time, however, maize-growing was one of the main industries on the North Coast, but since then rapid progress has been made in the dairying industry, and at the present time land which was formerly cropped is now laid down to paspalum and is carrying cows. More land has been reclaimed from the scrub and swamp, but butter has monopolised attention,

and maize has suffered in consequence. It is to be anticipated, however, that shortly there will be a swing of the pendulum backwards again. The establishment of bacon factories is ensuring that pigs can be profitably disposed of when ready for the butcher, and this will lead farmers to pay greater attention to this animal. Further, it seems that the pastures are becoming impoverished, and that the soil stands in need of renovation. The surest and most economical method of accomplishing this is by cultivation, the sowing of the right kinds of crops, and the application of manures.

One of the ablest authorities in the United States states that "by much successful experience among practical farmers, extending over the past twenty years, the conclusion is now coming to be generally recognised that, in a proper rotation of crops, but with a minimum of manure or fertiliser, the corn crop may be extremely useful in not only maintaining but in restoring the soil's fertility."

Further, some pastures, especially those of the South Coast, besides having been impoverished through the enormous quantities of phosphoric acid, potash, nitrogen, and lime removed in the thousands of gallons of milk taken from them, are becoming infested with useless grasses and weeds. The systematic cropping of this land with maize; leguminous crops, such as peas, beans, cowpeas, clover, or lucerne; and potatoes, would have the effect of restoring its fertility, and at the same time of destroying the obnoxious weeds.

Whilst it is desirable to increase the producing capacity of the land by growing crops rather than to allow it to remain "cow-sick," it is equally desirable that land which is already under cultivation should be made to give greater yields. On many of the rich bottom lands of the Hawkesbury and Shoalhaven, crops of over 100 bushels per acre were frequently garnered in by-gone days, but such are of extremely rare occurrence now-a-days, even in the most favoured season. The empirical idea that such crops were obtained in "drooping seasons," does not satisfactorily dispose of the case. The true reason is that, through the constant cropping which has been practised, the soil has become depleted of its fertility, probably more especially through the exhaustion of the humus. It is probably chiefly to the destruction of this substance, and the resultant effects upon the soil's physical condition, that the lessened fertility is due, rather than to the actual loss of the substances which directly act as plant nutrients. A greater diversity of crops is required, and the introduction of green crops which can be utilised in increasing the amount of humus in the soil.

Further, yields are kept at a low point by neglect to bestow upon the soil proper cultivation. Earlier preparation is required, so that frost may penetrate the soil in the winter months, exert its disintegrating powers, and destroy the numerous embryo pests that are lurking there; and so that the air and moisture, and later the warmth, may promote and encourage the chemical and bacterial processes which actually prepare the soil plant-food for the crop. During the growth of the crop more cultivation is required than is now given, so that the plant-food liberating agencies may

continue to act; so that weeds, which rob the plant of moisture and food, may be destroyed; and so that, through the loosened condition of the surface soil, moisture may be retained.

Greater attention is required in the selection of varieties and of the seed of the varieties. Less care is taken in the selection of seed maize than of any other seed, with the exception perhaps of potatoes. The wheat-farmer as a rule does select good varieties, and good seed of those varieties, and frequently changes his seed; but the maize-farmer rarely troubles much about the matter. That a tremendous loss in yield occurs regularly through this one cause is shown by the experiments conducted on maize-growers' farms by the Department of Agriculture. Improved varieties consistently outyield local varieties, often by many bushels.

By systematic attention to these points of proper rotation, manuring, cultivation, and the introduction of new varieties, and then careful selection of the seed, the yield could be enormously increased, and the State would be in a position to raise all the maize required, rather than be an importer, as at present, to the extent of about 800,000 bushels per annum.

AREA UNDER MAIZE FOR GRAIN IN NEW SOUTH WALES.

Five years, 1905–6 to 1909–10.

Divisions.	1905-06.	1906-07.	1907-08.	1908-09.	1909-1910.
	acres.	acres.	acres.	acres.	acres.
North Coast	77,782	68,372	63,083	69,299	76,431
Hunter and Manning	39,225	38,633	38,706	37,821	44,221
County of Cumberland ...	4,878	3,652	2,883	3,248	4,396
South Coast	15,094	13,607	10,368	14,522	16,911
Total Coast	136,979	124,264	115,040	124,890	141,959
Northern Tableland	17,556	16,166	12,526	15,292	18,617
Central ,, ...	9,912	9,953	10,097	11,512	16,915
Southern ,, ...	2,243	1,695	1,297	1,803	2,275
Total Tableland	29,711	27,814	23,920	28,607	37,807
North-western Slope	8,153	10,420	10,237	13,321	15,071
Central-western ,, ...	6,225	5,428	5,525	7,063	10,120
South-western ,, ...	7,892	5,855	5,801	6,184	7,238
Total Western Slopes ...	22,270	21,703	21,563	26,568	32,429
North-western Plain	117	132	292	358	316
Central-western ,, ...	133	134	164	259	275
Riverina...	143	68	......	118	2
Total Western Plains and Riverina.	393	334	456	735	593
Western Division (Darling) ...	.....	......	1	12	9
Total New South Wales ...	189,353	174,115	160,980	180,812	212,797

PRODUCTION OF MAIZE IN NEW SOUTH WALES.

Five years, 1905-6 to 1909-10.

Divisions.	1905-06.	1906-07.	1907-08.	1908-09.	1909-1910.
	bushels.	bushels.	bushels.	bushels.	bushels.
North Coast	2,603,230	2,429,026	2,047,980	2,399,971	2,848,000
Hunter and Manning	1,138,069	1,410,337	1,141,260	1,110,045	1,588,638
County of Cumberland ...	120,396	63,928	54,832	75,334	147,453
South Coast	462,344	540,578	357,928	629,794	742,827
Total Coast	4,324,039	4,443,669	3,602,000	4,215,144	5,326,918
Northern Tableland	505,455	424,508	244,384	307,627	500,820
Central ,, ...	217,153	228,415	219,192	214,691	466,338
Southern ,, ...	28,569	54,343	27,072	43,529	52,520
Total Tableland	751,177	707,266	490,648	565,847	1,019,678
North-western Slope	168,576	257,117	167,596	192,000	295,007
Central-western ,, ...	41,414	117,290	72,636	48,270	166,363
South-western ,, ...	251,412	232,322	188,176	187,216	277,954
Total Western Slopes ...	461,402	606,729	428,408	427,486	739,324
North-western Plain	980	3,311	2,748	4,918	6,615
Central-western ,, ...	740	1,519	4,020	1,853	5,430
Riverina...	1,412	506	......	560	10
Total Western Plains and Riverina.	3,132	5,336	6,768	7,331	12,055
Western Division (Darling) ...	......	......	28	230	280
Total New South Wales ...	5,539,750	5,763,000	4,527,852	5,216,038	7,098,255

AVERAGE YIELD PER ACRE OF MAIZE IN NEW SOUTH WALES.

Five years, 1905-6 to 1909-10.

Divisions.	1905-06.	1906-07.	1907-08.	1908-09.	1909-1910.
	bushels.	bushels.	bushels.	bushels.	bushels.
North Coast	33·5	35·5	32·5	34·6	37·4
Hunter and Manning	29·0	36·5	29·5	29·3	35·9
County of Cumberland ..	24·7	17·5	19·0	23·2	33·5
South Coast	30·6	39·7	34·5	43·4	43·9
Total Coast	31·6	35·7	31·3	33·8	37·5
Northern Tableland	28·8	26·3	19·5	20·1	26·9
Central ,, ...	21·9	22·9	21·7	18·6	27·6
Southern ,, ...	12·7	32·1	20 9	24·1	23·1
Total Tableland	25·3	25·4	20·5	19·8	27·0
North-western Slope	20·7	24·7	16·4	14·4	19·4
Central-western ,, ...	6·6	21·6	13·1	6·8	16·4
South-western ,, ...	31·8	39·7	32·4	30·3	38·4
Total Western Slopes ...	20·7	28·0	19·7	16·1	22·8
North-western Plain	8 4	25·1	9·4	13·7	20·9
Central-western ,, ...	5·6	11·3	24·5	7·2	19·7
Riverina	9·9	7·4	.. ..	4·7	5·0
Total Western Plains and Riverina	8·0	16·0	14·8	10·0	20·3
Western Division (Darling) ..	... .	....	28·0	19·2	31·1
Total New South Wales...	20·3	33·1	28·1	28·8	33·4

AREA UNDER MAIZE FOR GREEN FODDER IN NEW SOUTH WALES.
Five years, 1905-6 to 1909-10.

Divisions.	1905-06.	1906-07	1907-08.	1908-09.	1909-1910.
	acres.	acres.	acres.	acres.	acres.
North Coast	1,876	1,909	3,010	2,472	2,618
Hunter and Manning	5,063	4,981	4,888	4,142	2,698
County of Cumberland ...	1,910	2,968	2,295	2,448	2,579
South Coast	6,363	7,826	8,349	8,204	9,577
Total Coast	15,212	17,774	18,542	17,266	17,472
Northern Tableland	217	680	1,368	1,527	628
Central ,, ...	1.437	1,424	2,844	3,066	1,421
Southern ,, ...	996	592	855	900	608
Total Tableland	2,650	2,696	5,067	5,493	2,657
North-western Slope	472	1,072	2,221	1,494	742
Central-western ,, ...	622	982	1,501	2,863	878
South-western ,, ...	1,146	1,178	1,644	1,439	711
Total Western Slopes ...	2,240	3,232	5,366	5,796	2,331
North-western Plain	17	21	15	33	... .
Central-western ,, ...	112	244	102	180	19
Riverina...	6	11	358	133	52
Total Western Plains and Riverina	135	276	475	346	71
Western Division (Darling) ...	1	3	1	11	5
Total New South Wales...	20,238	23,981	29,451	28,912	22,536

According to the latest estimate of the United States Department of Agriculture, the world's production of maize is about 3,478,328,000 bushels, contributed mainly by the United States, Austro-Hungary, The Argentine, Italy, Roumania, Mexico, and Russia, as follows :—

	Bushels.	Per cent.
United States	2,668,651,000	= 76·9
Austro-Hungary	190,651,000	= 5·5
The Argentine	136,057,000	= 3·9
Italy	95,953,000	= 2·7
Roumania	78,892,000	= 2·2
Mexico	70,000,000	= 2·0
Russia	61,112,000	= 1·7
	3,301,316,000	
Other countries	177,012,000	= 5·1
Grand total	3,478,328,000	=100·0

The Australasian contribution was a little under 9,000,000 bushels, or about ¼ per cent. of the world's production. New South Wales produces rather more than half the Australasian crop.

The average yields per acre of maize in each of the foregoing countries (with the exception of Mexico, for which the figures are not available) for the five years 1904 to 1908 were as follow :—

Countries	1904.	1905.	1906.	1907.	1908.
	bushels.	bushels.	bushels.	bushels.	bushels.
United States	26·75	28·81	30·26	25·95	26·22
Austro-Hungary	Not available.		25·42	22·71	22·66
The Argentine	33·65	24·89	29·02	10·18	20·24
Italy	18·87	20·08	20·71	19·74	21·55
Roumania	3·79	12·14	25·37	12·08	15·84
Russia	7·34	9·52	22·01	14·62	16·83

SUITABLE DISTRICTS.

Experience has shown that maize can be successfully grown in this State in districts which differ widely in temperature and length of season. The coastal area, from Moruya and Bega to the Tweed, offers almost ideal conditions for its growth, while in the colder districts of Tumut and Gundagai on the southern tableland, and Tenterfield on the northern tableland, it is one of the main crops. At Inverell in the north-west it is extensively grown.

These instances indicate that in so far as temperature is concerned almost any locality is adapted to its growth. Essentially a summer crop, it reaches its greatest degree of development where the summer is long and warm. The great vegetative growth calls for large quantities of moisture, and where this is abundant and the soil is in a condition to supply the necessary plant-food, enormous crops are obtained. Moist atmospheric conditions encourage growth, and thus the heaviest crops are, as a rule, grown near the coast.

Next to wheat, maize is probably the most adaptive farm crop. Where all the conditions are favourable, yields of over 100 bushels per acre are not uncommon and by no means extraordinary. The highest authenticated yield is probably one of 255 bushels per acre. This was obtained from a crop grown in a prize competition, and it is doubtful if it was commercially profitable.

The determining factors, then, in successful maize culture are the quality of the soil, the rainfall, and the length of the summer season. The effect of temperature may to some extent be neglected, because, as the recital of proved districts shows, maize can be grown satisfactorily in almost any part of the State. Varieties have been bred or so modified by selection that a kind adapted to the length of the season in any particular district may be obtained; in fact, experience seems to show that maize naturally acclimatises itself. If a particular variety be grown for any length of time in, say, a locality with a short summer season, it develops the character of early maturity, while on the other hand if the season be long the date of maturity is delayed. Thus we see that some varieties ripen grain in three or four months, while others require five or six months, and some even longer.

The maize plant is susceptible to frost, and is often destroyed by it. The young growth is not affected so much as the old plant. If heavy frosts occur when maturity is being approached, the growth is arrested and the grain shrivels. Where the season is short, varieties must be selected which, when planted after the last frosts, will ripen their grain before the cold weather again returns.

Whether maize will be a profitable crop in any one particular district depends principally upon the rainfall, the evaporation, and the capacity of the soil for retaining moisture. It is not sufficient that the rainfall is so many inches per annum; much depends upon how fast this moisture is drawn away from the soil. As man in his cultural processes upsets nature's schemes, the rate of evaporation depends partly upon him and partly upon nature. Under natural circumstances soil may lose its contained moisture quickly, but as man is able to retard the rate of loss, it is necessary in considering the effect of rainfall to consider also the effect of cultivation.

The natural rate of evaporation, however, does have a most important bearing upon maize culture. In a climate such as ours is generally, the fertility of the soil is determined very considerably by how long it will retain moisture. The rain, as a rule, is not distributed in light showers, but falls in heavy downpours intermittently. It follows, therefore, that when a heavy fall occurs, growth goes on normally until the soil-moisture is exhausted, and then ceases until further rain is received. In some cases, however, abnormal growth is made after rain, and soft sappy plant tissues are developed which require enormous amounts of moisture to maintain them in a healthy condition, and which suffer correspondingly with their degree of sappiness if this is not forthcoming.

If one soil holds the moisture well, it will produce better crops than one of less capacity, even though the latter be situated in a district with a better rainfall. Similarly, if man by his cultural methods can retard evaporation, he is able to produce crops in districts which naturally may be somewhat unsuitable. Even in favoured localities, as, for instance, parts of the North Coast, which in the main is ideal maize country, some soils are so non-retentive of moisture that grain crops are often prejudicially affected by even short periods of dry weather.

Owing to the difference in the rapidity of evaporation from the soil, the rainfall of the interior is not as effective as that of the coast. In the latter region, owing to proximity to the sea and the consequent moist condition of the atmosphere, soil retains its moisture for a longer period, and crops therefore gain greater benefit from it. At Sydney, for instance, the evaporation is only 42·09 inches per annum, while at Dubbo it is 82·78 inches. It cannot be expected, therefore, that a 27½ inches rainfall at Tamworth will be as effective as the same rainfall on the coast. At Tamworth the inland air is practically devoid of moisture, and as it has great affinity for it, that contained in the soil is rapidly sucked up. On the coast the air naturally contains more or less, and consequently does not draw the soil-moisture away so rapidly.

Further, the season of the rainfall is, of course, a most important factor. A district may have a high annual rainfall and yet be unsatisfactory for maize, simply because the rainfall occurs at unsuitable times. Whilst by cultural methods much benefit may be derived from the rainfall of autumn and winter, good crops cannot be produced without summer rains. Therefore, only those districts are suitable for maize which have good rains at that time of the year. The established maize districts are splendidly treated in this respect, but we have many yet undeveloped, where, if nature is assisted by man, the crop may be grown successfully.

It may be said that the critical time with maize is when it is tasselling. Rain is urgently needed by it then, and if it cannot be reasonably expected, or its place supplied by irrigation, maize-growing is out of the question.

By selecting the right class of soil and following proper methods of preparation, moisture may be conserved in the soil, which, in addition to light showers during the period of growth, will enable the crop to be started in a comparatively dry time, and be in a condition to respond to heavy rain when it falls. By an approved system, therefore, greater benefit may be derived from the rain.

In the north-west a heavy average rainfall is registered in the summer months, but it is distributed principally over the three months of January, February, and March. The spring and early summer are dry, while late autumn and winter are also dry. These summer rains are chiefly the results of monsoonal disturbances, and as these are intermittent, the annual averages cannot be taken as an indication that so much rain can be expected in those months. They are, in fact, only the mean between extremes of plenty and drought. The monsoonal disturbances may occur early in January or not until late in February. Several inches may be recorded in a few days in any one of these three months, especially in January or February, and if the disturbance occurs in January, February and March may be comparatively dry, and *vice versâ*. The averages for each month, therefore, make the weather conditions appear more favourable than they really are.

Again, in some seasons the rainfall may be exceptionally heavy in these months, as in the past two years, while in others it may be poor. These occasional heavy records have the effect of increasing the average and making it appear good.

If the monsoonal disturbance occurs at all, it can usually be looked for towards the latter half of January and in the early half of February, and in growing maize it is essential that it should be got to such a stage at this time that the rain will do the most good. An endeavour should be made to so grow the crop that tasselling will coincide with the period of the rainfall. By proper preparation of the soil and its cultivation during the growth of the maize, this can be assured in most seasons. If this is done systematically, the yields will, on the average, be much superior to those now

usually obtained. The laws of nature are, on the average, unalterable, and most failures are due to not considering them sufficiently before sowing the crop.

In considering the question of suitable districts, so much depends upon the nature of the cultivation given and the character of the land that the rainfall and the evaporation cannot be taken as the sole determining factors. In almost every district, however, suitable soils exist, and given proper cultivation it is possible to determine from the rainfall records with some degree of accuracy what districts are suitable. In farming, a certain amount of risk attaches to every crop ; success depends upon many circumstances ; but where the crop may be of value in more than one way, the risk is very materially lessened. Thus, if maize does not prove successful as a grain crop, its value as fodder more than repays the cost of cultivation. This usually ensures the farmer against monetary loss when he sows maize. In most of the north-west the conditions are not sufficiently favourable to warrant a farmer taking land with the object of making it his main crop. At the same time, they are sufficiently so to make it a profitable crop in connection with others, such as wheat. Indeed it is a question worth considering in the drier parts of the State, where fodder crops are somewhat difficult to grow, whether the growth of maize for the direct purpose of providing feed for sheep would not be thoroughly justified. At any rate it is valuable as green fodder for all classes of stock, and if the crop fails for grain the grower is not out of pocket on his work. Further, the preparation of the land will, by its effect upon the soil, benefit the succeeding wheat crop.

The one great obstacle that stands in the way of the extension of maize-growing in the drier districts is the belief that it is only a chance whether a crop is obtained. It is looked upon as a chance crop, and is treated as such —that is, the seed is merely put in and no further attention bestowed upon it. If only proper treatment were given, maize would soon gain a permanently sound position as a general crop.

Bearing in mind that it is worth growing and tending as well for the sake of its grain as its merit as green fodder, the following districts are indicated as suitable to a more or less degree :—

The South Coast.

Maize has long been grown in the districts bordering the coast, and at times phenomenal yields have been obtained on the rich alluvial flats adjacent to the rivers. The yields vary and depend principally upon the fertility of the soil. The rainfall is such that good returns are obtained, despite the fact that often very little attention is given to the crop.

The Valley of the Hawkesbury

Maize has been grown in this valley since the very early days of the Colony. Generations of farmers have annually taken their rich harvest of golden grain from these fat lands. Maize-growing has been so long carried on along the Hawkesbury, and has played such an important part in the

settlement of the districts along its banks, that the two names of maize and Hawkesbury are inseparably bound together. Some wonderful crops have been obtained, and still, after very many years of cropping, yields of 70 to 80 bushels per acre are taken from land which has never tasted artificial fertilisers. In this valley nature has been prodigal in her gifts, with the invariable result that all the burden has been thrust on her, and she is little assisted by cultivation. It has been abundantly shown, however, that careful cultivation by the farmer brings its reward in heavier crops.

The Valley of the Hunter.

This valley has also for long been associated with maize-growing. The soil along the river and its tributaries is admirably suited for maize-growing, while some of the higher land also gives good crops. The rainfall is very favourable, but the crops could be vastly improved by stricter attention to cultivation.

The North Coast.

The conditions along the northern rivers bordering the coast are extremely favourable to maize. The rainfall is abundant, and the moist atmospheric conditions favour growth. Much of the soil produces good crops, but some, although well supplied with plant-food, fails to return good yields of grain in some seasons owing to the non-retentive nature of the soil. It requires improving by the addition of humus.

The Northern Tablelands.

On this elevated northern portion of the State, maize is an important crop. Around Tenterfield many farmers are engaged in its culture, and in the aggregate a very considerable quantity is produced. At Tenterfield the soil is of granitic formation, and is chiefly light, and of only medium fertility. Although the crops do not yield nearly as largely as where the soil is of greater fertility, still they are sufficient to render the crop profitable. Forty bushels per acre would be considered a high yield, while 25 to 30 bushels constitute a good crop. It is the mainstay of the Tenterfield farmers, and is the means of maintaining many in a state of independence and comfort.

Around Armidale, Glen Innes, Glencoe, and possibly a few other places where more fertile land is found, larger crops are obtained.

Almost the whole of the New England tableland is suitable for the cultivation of maize, but at some of the highest points, as Guyra, Ben Lomond, and Llangothlin, the season is erratic, and the crop does not always have sufficient time to mature grain.

The Inverell District.

This locality cannot be included in the Northern Tablelands, as the climatic conditions are different. Neither can it be classed with the bulk of the North-western Slopes, as the climate is far more favourable to maize than the Tamworth, Gunnedah, or Narrabri districts.

Generally excellent crops are obtained. The deep, rich, basaltic soil and the deep free red loams, whilst having a suitable physical nature, are admirably supplied with those ingredients which feed the plant.

The rainfall is always sufficient to produce a good crop, while in favoured years yields rivalling those of the rich coastal lands are secured. During the 1910–11 season a yield of 110 bushels per acre was recorded near Inverell.

The North-western Slopes.

The chief centres of this group are Tamworth, Manilla, Quirindi, Gunnedah, Boggabri, Narrabri, and Warialda. The districts which have been mentioned hitherto are well adapted for maize, and it forms a main crop in all, while in some it is the chief crop; but it does not occupy such a place on the North-western Slopes. It can only be regarded there as an occasionally successful crop. In some years very payable yields are obtained, but in others very little grain is obtained. It has yet to be proved, however, that, as frequently stated, the climate is unsuitable, and that despite the good crops which are sometimes obtained, maize is not worth considering as a grain crop. In some soil-favoured spots it is grown constantly, but in all other cases it is only sown as a chance crop. Until systematic demonstrations are made over a number of years, it will be only shirking the question to state that the crop is not profitable. It is certain that the climate and soil are unfavourable if they are depended upon alone to produce a crop after the seed is merely thrown into the ground after a plough; but it has yet to be shown that the crop is not suitable if proper methods of culture are adopted and practised, the right varieties sown, and the right time for seeding selected.

The Central-western Slopes.

The conditions here are somewhat similar to those of the North-western Slopes, but are rather less favourable for grain production, except at, perhaps, a few favoured places. In these districts, however, the experiments of the Department of Agriculture have shown that very profitable crops of fodder are obtained.

The Central Tablelands.

These are more or less suitable. In some localities very fair crops are secured, whilst in others the conditions are less favourable.

The South-western Slopes.

The climatic conditions of this district vary considerably. In portions, as around Tumut, excellent crops are obtained, whilst in others the rainfall is insufficient to render maize a profitable crop. Tumut is noted for its high yields and the excellent keeping qualities of the grain.

Southern Tablelands.

The rainfall in this division is in general favourable, and in most of the centres, except those where the summer is too short, maize ought to be successfully grown. Varieties must be selected which ripen early.

The Plains and Riverina.

The rainfall in these divisions is insufficient for the requirements of maize, and its cultivation could only be made profitable by the practice of some method of irrigation.

The chart prepared by Mr. H. C. L. Anderson, and published in the *Agricultural Gazette* for July, 1911, shows graphically the distribution of the rainfall in the western portion of the State, and is a useful guide in determining suitable districts for maize. This was designed primarily to indicate the rainfall in the wheat-growing season, but it is quite as useful to the maize-grower as to the cultivator of wheat. Broadly, it may be said that where the average monthly rainfall from November to March inclusive is above 2 inches, maize can be expected to be a profitable crop when the right class of soil is selected, and proper cultivation is given. It will be seen from the chart that in the north-western portion of the State the summer rainfall is high, and that southwards it gradually diminishes in volume. Thus it is found that in the north-west maize is a successful crop, but becomes less and less so the further any particular district lies to the south.

Whilst, however, the rainfall in many cases is sufficient in itself, the evaporation is so high that maize suffers. Some means of checking it is required, and it is the failure to adopt such means that has caused the impression that maize is not a profitable crop. Better farming is required, and until such is practised, maize-growing will only be a gamble with nature, except in those districts which are specially favoured.

(To be continued.)

Mould in Maize Cobs on the Northern Tablelands.

A great deal of loss seems to be taking place through mould developing in maize cobs in Leech's Gully and Tenterfield districts. It appears that if the mouldy cob is eaten by stock it causes their death; the yield of corn is decreased; and labour-saving machinery cannot be used in threshing the corn.

The Leech s Gully P.I.D. Union forwarded specimens of cobs to the Department, when the Bureau of Microbiology identified the disease as a mildew or "dry rot" fungus (*Diplodia zeæ*), a serious pest. Mr. A. H. E. McDonald, Inspector of Agriculture, discussed the matter with the local farmers, when it was agreed that the nearest approach to a practical remedy consists in selection of the right varieties, and selection of seed, so that cobs will be produced which will be so protected by good husks that water, which is the developing factor in this disease, will not gain an entrance.

The specimen forwarded to the Department was of the variety American Wonder, and it was stated that this variety is the one attacked most.

Maize Variety Trial, Grafton Experiment Farm, 1910-11.

A COMPARATIVE trial of seven varieties of maize was made at Grafton Experiment Farm during the season 1910–11. The plots were 13·96 chains long and ·56 chain wide. The first and every succeeding third plot were "check" plots, planted with the standard variety, Yellow Dent. The rows were 7 links (4 feet 7 inches) apart.

The experiment was planted on the alluvial soil of the Farm. Date of planting, 23rd December, 1910.

On 3rd January, 1911, the Manager reported that caterpillars had attacked and practically ruined a large section of the plots. Their attacks were, however, confined to one portion of the area, where weeds had been ploughed under, and about 5 chains of each row were uninjured. The Experiments Supervision Committee then directed that the damaged portion should be used for a commercial crop, and the uninjured portions of the rows retained for purposes of comparison. The result was that the areas actually harvested consisted of but ¼ acre of each variety. Half of this (⅛ acre) was harvested for greenstuff on 28th March, and the other half for grain on 12th to 14th June.

The yields are set out in the following table:—

MAIZE VARIETY TRIAL, GRAFTON EXPERIMENT FARM, 1910–11.

Variety.	Yield of Greenstuff per Acre.			Grain in Cob per Plot.	Threshed Grain per Plot.	Grain per Acre.	Percentage of Grain to Cob.
	t.	c.	lb	lb.	lb.	bushels.	
Yellow Dent (*check*)	9	11	80	376	287	40·96	76·33
Large Horsetooth	10	10	80	403	336	48·00	83·37
Small Horsetooth	7	5	32	301	244	34·80	81·06
Yellow Dent (*check*)	9	8	96	380	308	44·00	81·05
Turnbull	6	7	0	292	234	33·40	80·13
Leaming	6	0	48	232	190	27·20	81·89
Yellow Dent (*check*)	7	16	96	313	235	33·60	75·20
Humphrey's	7	3	64	304	245	34·96	80·46
Red Hogan	7	0	32	265	233	33·28	88·00
Yellow Dent (*check*)	8	18	16	374	290	41·44	77·54

Several factors, such as the lateness of the season, would prevent this being a true test of the productive capacity of the land, or perhaps even of the value of the varieties. The percentage of grain to cob is, however, interesting, and it is noticeable that in this respect the variety Red Hogan easily leads. The core in Red Hogan maize has been reduced to very light weight, and is indeed nearly all pith.

Ensilage on the North Coast.

The demonstrations given by Mr. George Marks, Inspector of Agriculture, have resulted in quite an impetus to the making of silage on the Manning. Messrs. Singleton and Longworth have obtained results on their farms which are highly satisfactory; so much so, that Mr. Singleton intends to make 500 tons this season for his two dairy herds. Mr. Marks is receiving many requests from farmers for assistance in this new undertaking for the North Coast. During the coming season he intends to urge Clarence, Macleay, and Barrington farmers to take the matter up.

The Department of Agriculture has a handy booklet on "Silos and Silage" (Farmers' Bulletin No. 6), being 95 pages of information and illustrations on this subject. Any North Coast or other farmer can obtain a copy free of cost by writing to the Under Secretary, Department of Agriculture, Sydney.

Spread of *Opuntia aurantiaca* (Prickly Pear).

This very great pest, described and illustrated with coloured plate in the *Gazette* for April, 1911, is more extensively distributed in this State than I imagined. Two fresh localities have been given to me by correspondents who saw the illustration.

The Shire Engineer of Kelso sends it from the Sofala district, and says, "It is growing in great profusion around Sofala, where there are thousands of young plants coming on."

A lady writes to say that this pest has made its appearance on her property near Liverpool.

All landholders are warned not to let this curse obtain a foothold on their properties. It should be carefully killed on sight, for reasons which will be clear to anyone who reads the article in April *Gazette*.—J. H. Maiden.

Increase of Weeds.

The enormous increase which results from allowing weeds to seed may be seen from the following short list, showing the number of seeds each of the weeds named is capable of producing in a single season:—

	No. of seeds on a single plant.
Groundsel	6,500
Corn cockle	2,590
Red poppy	50,000
Charlock	4,000
Sow thistle	19,000
Blackhead	3,000
Shepherd's purse	4,500
Cow parsnip	5,000
Stinking camomile	40,000
Ox-eye daisy	13,500
Burdock	24,520
Common dock	13,000
Dandelion	2,040

—*Mark Lane Express.*

Judging Maize at Shows.

THE SCORE CARD SYSTEM.

R. N. MAKIN, Inspector of Agriculture.

IF the competitions at our annual Agricultural Shows are to be as valuable in the improvement of maize as they should be, it is very necessary that some better method of judging should be arranged than that generally adopted. The possibilities in this direction are indicated by the improvement in wheat, to which Shows have largely contributed. The champion bag of wheat at the Sydney Show ten years ago would have little or no chance in competition to-day, because now the judging of wheat is carried out on proper lines—the flour strength is ascertained as well as the quality of the grain. But maize is judged exactly as it was a generation ago; and it is well known to growers that the maize which wins the prize at leading Shows is often a very inferior one for farmers to grow. For instance, the variety known as "Hawkesbury Champion" or "Golden King" might win a prize under present conditions; but this variety has 25 per cent. of core, and should not have an earthly chance in a competition, as farmers are reducing their yields by growing it.

Opinions differ very much as to varieties of maize and methods of judging, and much discussion often follows the verdict at Shows. During the last three years it has been my pleasure to be present at many of the Agricultural Exhibitions in different parts of the South Coast, and to closely watch the judging of different classes of grain. With a view to offering some little help to judges, the following score card has been drawn up for maize. Although it may not be suitable for all conditions, it should be of use in most.

Of course, to judge maize properly—and many societies would do well to make a note of this—it is necessary to have it exhibited in the cob. Shelled maize does not allow of the proportion of grain to core, thickness nor colour of core, nor shape nor length of cob, being ascertained.

To get really definite results, it is necessary that the maize entered in the competition should be supplied in the cob, and that it should be shelled out in the presence of the judges. It should then be judged according to a score card such as the following. This card has been adapted from several American authorities to suit our conditions as far as possible.

SCORE CARD FOR MAIZE.

Association________________________ Date ________________

Judge________________________________

	Standard.	Score. Nos. of Exhibits. 1	2	3	4	5	6	7	8	9
1. Shape of cob	5									
2. Colour of grain and core	15									
3. Uniformity	10									
4. Filling up of tip	5									
5. Filling up of butt	5									
6. Length and circumference of cob ...	15									
7. Condition of seed	5									
8. Shape and uniformity of kernel ...	10									
9. Space between rows...	10									
10. Proportion of grain to core... ...	20									
Total	100									

EXPLANATION.

1. Shape of cobs should be in accordance with the characteristics of the variety, the most desirable shape being cylindrical, *i.e.*, of equal circumference from top to bottom.
2. The colour should be whole, free from any discoloured grain. Yellow or red grain should have a red core, white grain a white core.
3. General appearance and trueness to type.
4. Tip full of grain and well rounded.
5. Butt well rounded off to shank and well filled; no spaces.
6. According to variety standard. Average circumference about 10 inches. Circumference of cob to be measured one-third way up from butt.
7. Ripeness, soundness, freedom from insect and fungus troubles.
8. Shape of kernel varies according to variety. Wedge shape is the ideal. Thin, shrunken, sharp-pointed kernels are objectionable. The germ in the grain should be large, and running well up to the tip.
9. A large space is undesirable. It is noticed chiefly in broad, short grained varieties, and is a serious defect.
10. A good cob should contain 85 per cent. of grain to core. A very important point.

Herd-testing Associations.

At the present time we have a number of inquiries regarding the best means to take in order to successfully establish Herd-testing Associations, and our Dairy Instructors have been urged to do everything they can to further the movement.

I would draw attention to the recent article in the *Agricultural Gazette* on this subject by me, and wish to point out that we have no distinct preference for any particular system, because it will be found that different systems will suit different localities and conditions. In some places the butter factory directors may be able to organise an association in connection with their factory, and in this way the work could be done much cheaper than by having the samples tested at each farmhouse, even if the samples have to be taken by a specially paid officer. This, however, should not be always necessary, and there is no reason why a butter factory could not, with the assistance of one man to supervise the taking of samples, serve up to 100 farmers. It will only be necessary for the supervising official to check the work of the farmers from time to time, because each farmer should be able to take his own samples and despatch them to the butter factory, properly numbered, &c. The supervising official would then, from time to time, visit those individual farms where high results were being obtained, and take check samples so as to prevent the possibility of deception through any farmer wishing to get a higher record for his herd, with the object of selling his stock. Of course, this would deceive the farmer himself as well as others, and it is not expected that anything of the kind would be attempted, except in very rare cases, and hence it is that a supervising official attached to a butter factory should be able to manage this part of the work for a large number of farmers.

Two men working in connection with a butter factory—one supervising and the other testing in the factory—should be able to do quite as many cows as four men who followed the system of taking the samples and testing the cows at the homes of the farmers. The expense attached to this latter method has, up to the present, been a big handicap to the herd-testing movement, and there is every reason to believe that where butter factories are situated in convenient centres, the work could be carried out by them in a more complete manner and at very much less expense. The samples could be brought in regularly by whatever conveyance brings the cream, and the factory manager could each week allot the names of the farmers who are to send the samples, and have forwarded to them the sample bottles in nicely-made cases; so that the farmers would have only to take the samples, record the weighing of the milk, and despatch the milks, with the record of the weights, to the manager of the factory.

The question is one which interests co-operative factories especially, to such an extent that it is only to be expected that factory directors will make considerable efforts towards developing the movement on successful lines.—M. A. O'Callaghan, Dairy Expert.

USE OF EXPLOSIVES IN CLEARING.

THE white gums on the Peel River, near Tamworth, though dead for a good many years, are very difficult to burn. Mr. J. McLernon, of "Nardoo," Nemingha, has been trying gelignite as a means of bursting the standing timber, so as to let the fire through.

The earth is cleared away from around the butt to a depth of about 6 inches, and a hole bored with an auger, slanting downwards from about ground level to the centre of the tree. Into this hole is placed half a plug of gelignite, with cap and fuse, and the hole gently tamped with earth. The shot bursts the butt of the tree and the roots, and so shatters the wood that the fire burns well below plough-level. To use more than half a plug of the explosive on a tree, say, 15 inches in diameter near the ground, will bring the tree down, which is not desired, as it burns better standing; but on large trees as many as three or four plugs are necessary to shatter the wood.

Farmers who have not used gélignite are advised to secure the services of an experienced miner, if they wish to test this method under their own conditions. Gelignite is harmless to those who understand it, but it can blow up other things besides timber.

YANKEE GRUBBING.

THE Minister of Agriculture (Hon. J. L. Treflé) recently obtained a report from Mr. H. Ross, Inspector of Agriculture in the Southern district, respecting the comparative values of "Yankee grubbing" and then using the stump-jump plough; and cleaning the land sufficiently deep to use the set plough. The Minister has directed that Mr. Ross' report shal serve as a guide for advising farmers until superseded by a later report.

Mr. Ross states:—

There are two methods employed in clearing wheat land for the plough: First, grubbing out the trees and roots to a depth of 9 or 12 inches; and second, burning off the timber and stumps just 1 or 2 inches below the surface. The latter method is generally referred to as "Yankee grubbing." On land cleared by the former process a set plough is used; in the latter case a stump-jump plough is employed.

The cost of Yankee grubbing depends entirely on the length of time the timber has been ringbarked. Thus a paddock in which the timber has been rung (say) for seven or eight years will cost far less to clear than a paddock in which the timber has only been rung for three or four years.

The usual procedure is to stack small wood and limbs against the ringbarked trees, and then to set fire to the paddock. March is considered to be the best time for burning off.

Land can be cleared in this way, ready for the stump-jump plough, at from 7s. 6d. to 14s. per acre, according to the length of time the timber has been rung. The cost of clearing land for the set-plough—that is, grubbing stumps and roots to a depth of 9 to 12 inches—will be just double that amount.

Yankee grubbing is the method employed by fully 80 per cent. of all wheat-growers. The man who is just making a start cannot afford the extra cost of grubbing thoroughly, and he is anxious to get as much crop in as possible during the first year, so he cannot afford the time to thoroughly rid the paddock of all stumps and roots.

The general opinion held by wheat-growers is that the yields from a Yankee grubbed and from a thoroughly grubbed paddock, other conditions being equal, are about the same. Personally, I have never been able to notice any difference in the yields between the two methods. I may mention that some of the heaviest yields in my experiments were obtained from Yankee grubbed land.

The cost of ploughing with a stump-jumper does not exceed that of ploughing with a set plough. The former is certainly a little heavier, but this can hardly be taken into consideration. As to the respective merits of the work performed by the two kinds of ploughs, there is not much to choose; but, of course, for obvious reasons, only a stump-jump plough is used on Yankee-grubbed land.

In wheat-growing centres, such as Lockhart, Henty, Temora, Wyalong, Ganmain, and Coolamon—in fact, right throughout Riverina—Yankee grubbing is, by an overwhelming majority of practical wheat-growers, acknowledged to be the cheapest and most practical method of clearing land, for the reasons that—

1. Yankee grubbing costs only one-half the amount of clearing land thoroughly.
2. Yankee grubbing saves time, thus enabling the man just making a start to put in a larger area of crop.
3. Yankee-grubbed land will return as good a yield as land cleared by any other method.

The foregoing refers to country carrying grey box, yellow box, stringybark, pine, bull oak, and apple-tree. It in no way refers to tree or whipstick mallee, in which country the method of clearing is entirely different, though the stump-jump plough is invariably used.

THE CAROB TREE (*Ceratonia siliqua*, LINN.).

THE Carob is a beautiful evergreen tree, which will grow in almost any situation where severe frosts are unknown, on almost any kind of soil, and yield up to nearly half a ton of nutritious pods per annum. This fodder will be dropped to the ground when ready for consumption. The tree is slow in growth, and does not bear for the first seven years, even when grafted; but its longevity is remarkable, and trees over one hundred years old are still flourishing. In addition to its fodder value it may be trained into a very ornamental shade tree, and may also be planted as a breakwind to orchards in exposed positions. It sometimes attains a height of 50 feet.

The Carob, or Locust Tree, is a native of the Mediterranean regions, which have a climate similar to our own. It may be grown from seed, but preferably from layers or cuttings, or by grafting. Cuttings or layers should be put in small boxes filled with sandy soil, in the early autumn. They should be ready for transplanting to their permanent home in about six months. Before planting out, if the soil is not of a sandy or loose character it should be broken up, and it may be advisable to put a cartload of good soil with each tree to give it a good start. Afterwards, the trees require only ordinary attention.

If grown from seed, the best time to sow is August. The seeds should be softened by immersion in hot water, afterwards being kept near the fire for several days. It is better to sow the seed where the tree is intended to remain, protecting it with a small guard of netting. Grafting may be done in early spring, and when the plants are about 3 feet high.

The trees may be planted in groves as close as 20 feet apart. As they cannot tolerate water, the best site is a hillside, where also the effect is most picturesque. In Italy, barren, stony slopes have been clothed with luxuriant green by groves of these trees.

Care should be taken to have a fair proportion of male and female trees, as otherwise there can be no crop. Bees assist greatly in fertilisation.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, WESTERN DIVISION, 1910–11.

MARK H. REYNOLDS, Inspector of Agriculture.

THE potato season just closed has been unique on account of the widespread infection by Irish Blight *(Phytophthora infestans).* The disease appeared on the foliage in the latter part of February. For some weeks previously, a succession of moist easterly winds occurred, and no doubt blight spores were carried from infested coastal areas. The disease was very prevalent on the western slopes of the Blue Mountains, and occurred in patches as far west as Orange.

Prior to infection by blight, the favourable weather conditions presaged record yields of potatoes. The blight rapidly destroyed the haulms, converting them into a black, jelly-like mass. A fortnight after infection was first noted at Oberon, weather conditions changed, and dry westerly winds prevailed. The jellied haulms were rapidly dried up, and only occasional tubers near the surface had developed blight. Possibly the disease on the foliage was arrested by the change in the winds, before spore formation occurred to any extent, because although wet weather has been experienced during the winter, the disease has not developed to any extent in the tubers. So little have these been affected that farmers are not treating the blight seriously.

Two of the Western Plots were affected by blight—those at Oberon and Rydal. These plots were located on easterly slopes, and, like farmers' crops so situated, showed signs of disease before potatoes growing on western slopes. As an instance of how lightly seed potato merchants view the possibility of blight devastation, high prices are being paid Oberon farmers for seed potatoes.

What the Experiments have Demonstrated.

(1.) *The success of Formalin Dip in destroying Scab.*—In every instance the seed potatoes were dipped in a formalin solution, 1 lb. of chemical to 30 gallons of water. The potatoes harvested were free from scab. Farmers' lots adjoining, where the seed was not treated, were in some instances very scabby.

(2.) *The value of employing a complete manure,* like P4, at the rate of 4 cwt. to the acre, at a cost of £1 11s. per acre, was fully demonstrated by the increased yields. At Rydal, the unmanured plot of Brownell's Beauty potatoes was much more infested with blight than the manured sections.

(3.) *The suitability or otherwise of varieties of potatoes not previously grown in the districts.*—Coronation, Bliss' Triumph, and Queen of the Valley

did exceptionally well. The variety Blue Derwent in every instance did not properly develop, being a late variety. The favoured time for planting potatoes on the cool western tablelands is during the period 7th November to 15th December. By planting Blue Derwents during the third week in October better results may possibly be obtained. Although this variety was sown late, it yielded well, but a large proportion of the tubers were small.

(4.) *Loss of weight in potatoes stored in bags.*—From 13th September to 28th November, the 10 cwt. of potatoes held at Orange for planting lost 164 lb. in weight. The greatest loss was in Coronation, 28 lb.; then Adirondack, 27 lb. on each cwt. Decayed tubers formed a small percentage of this loss. Some loss was recorded with the other lots; but further examples are not necessary to emphasise the loss that farmers incur in holding potatoes in store at this period. Loss is occasioned by diffusion of moisture from the tuber to the drier atmosphere, but increases at the time the buds begin to sprout. It is necessary to rub off all shoots as they appear until shortly before planting, not only to reduce loss of weight, but to protect the food material stored in the tuber, which is elaborated by ferments into the liquid form, being converted into plant tissue in the shoots, and thus sapping the vitality of the seed potato.

Of course, the loss is not so great when the potatoes are kept in pits (covered with straw and then earth). Potatoes stored in the field and covered only with straw, will have lost, on an average, three months after digging, ½ cwt. per ton; so that tubers selling at £5 per ton in May need to bring £5 2s. 6d. in August to be equally profitable.

I have had instances mentioned to me where a greater loss occurred.

Preparation of the Seed-bed and After-cultivation on the Experiment Plots.

In every instance the land was twice ploughed and harrowed before planting. When three-fourths of the crop was showing above ground the whole field was harrowed.

Later, a cultivator was run between the rows, throwing the soil towards the plants, but hilling was not resorted to. Just prior to flowering time, further horse cultivation was impracticable, owing to the abundant growth of haulms.

Selecting Seed Potatoes.

At Wyaldra a selection of seed potatoes was made from different varieties. A number of plants were uprooted, each containing the tubers attached. A selection was then made from the plants that produced the greatest number of large tubers. If there were six large tubers and one small one on one plant, and five large tubers and three small ones on another, the small one on the first mentioned plant was selected. Also, if the whole of the potatoes were large, one was selected. There are circumstances which may favour any one plant and cause the production of more large tubers, and this result is likely to have its influence on succeeding generations of potatoes.

Experiments under Straw.

In three warm and dry localities—Dubbo, Grenfell, and Gilgandra—experiments were carried out with the variety Satisfaction. The area was cultivated in the ordinary way, one portion being covered with straw. No satisfactory results were obtained, and the experiment was not successful.

At Grenfell a stray tuber of Bliss' Triumph was planted, and the set yielded so well that a further trial will be made with this variety this year at Dubbo, Maryvale, and Grenfell. Apparently Satisfaction was too slow in maturing.

Effect of Blight on the Several Varieties.

RYDAL PLOT RESULTS.

Comparatively free from Blight.—Bliss' Triumph, Cambridge Kidney, and Adirondack.

More affected.—Coronation, Queen of the Valley, Up-to-Date.

Most affected.—Brownell's Beauty, Freeman, Blue Derwent.

Estimated blighted tubers from the 1 acre—12 cwt.

OBERON PLOT RESULTS.

Comparatively free from Blight.—Bliss' Triumph, Satisfaction, Queen of the Valley, Blue Derwent.

More affected.—Early Rose, Adirondack, Freeman.

Most affected.—Brownell's Beauty, Coronation, Up-to-Date.

Estimated blighted potatoes from the 1 acre—Under 5 cwt.

At both places Bliss' Triumph proved the best resister of blight, and Brownell's Beauty the worst.

As a number of farmers are desirous of knowing the cost of producing potatoes at Wyaldra, I quote the expenses and returns:—

Cost of Producing 1 *acre of Potatoes at Durrie Farm, Wyaldra.*

	£	s.	d.
Ploughing twice	0	10	0
Harrowing, at 1s. each operation	0	4	0
Cultivating with Planet Junior	0	7	6
Planting (ploughing and dropping)	2	2	0
400 lb. manure	1	10	0
½ ton seed (say at £6)	3	0	0
Digging and bagging (digging at 9d. per bag; bags, 5d. each)	4	4	0
	£11	17	6

The potatoes were sold for £31 12s. 3d., leaving a profit of £19 14s. 9d. from 1 acre of potatoes. Marketable potatoes sold at £7 10s., small (pig feed) at £1 per ton.

I desire to point out that generally the weather conditions were suitable for potato culture, and that before the Wyaldra district can be classed as suitable for profitable potato culture, further tests over a number of years are necessary.

Farmers who conducted the Experiments.

Cool Tablelands—

Noonan Bros., Millthorpe.
Jas. Hunter, Rydal.
H. Rotchley, Orange.
Lambert and Kelly, Oberon.
J. Thompson, Orange.

Warm and Medium Dry—

Wm. A. McDougall, for Mrs. D. McMaster, Wyaldra.

Hot Western Conditions—

W. Baird, Dubbo.
J. W. Lithgow, Gilgandra.
C. J. Maslin, Grenfell.

These gentlemen ably assisted me by carrying out all the details required. The plots created an amount of interest amongst neighbouring farmers, a number of whom expressed to me their appreciation of the efforts made by the Department of Agriculture in their behalf.

Results Compared with District Yields.

Considering that the Government seed potatoes were removed early from the pits and sent to Sydney—a warmer climate—and later sent out to the different localities, with a consequent considerable knocking about, the returns compare very favourably with the crops in the different districts, and should emphasise the value of manuring and a little extra attention to cultivation.

YIELDS.

Variety.	Orange.	Millthorpe.	Rydal.	Birriwa.	Average.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Adirondack	[illegible] 14 3	3 5 1	5 7 1	4 5 3	4 18 1
Bliss' Triumph	.. ..	3 5 1	7 4 0	4 5 2	4 18 1
Brownell's Beauty	4 16 2	6 2 3	4 10 0	4 16 3	5 1 2
Blue Derwent	6 6 3	6 7 2	2 12 0	4 17 3	5 1 0
Coronation	5 13 0	7 5 1	10 4 0	6 0 0	7 5 2
Early Rose	....	....	....	4 1 0	4 1 0
Freeman	6 7 0	5 10 2	8 10 3	5 6 3	6 8 3
Queen of the Valley	7 12 2	6 0 0	7 17 1	4 18 2	6 12 0
Satisfaction	....	4 5 3	9 6 0	....	6 15 3
Up-to-Date	7 2 1	4 3 2	10 11 0	....	7 5 2
Early Manhattan	....	5 16 0	....	....	5 16 0

MANURE EXPERIMENT.

	Millthorpe.	Rydal.	Birriwa.	Average.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Unmanured...	4 17 3	1 14 1	3 2 3	3 4 3
P1 manure	6 2 3	4 10 0	4 16 3	5 3 0
P4 ,, ...	6 14 0	5 8 0	4 4 2	5 8 3

Lucerne Seed.

Colour, Germination, and Anatomy.

EWEN MACKINNON, B.Sc., Economic Botanist.

"Botanically, *Medicago sativa*, L.—Lucerne or Alfalfa—is an exceedingly diverse species, composed of numerous strains, varieties, and, possibly, sub-species. The natural variability of the species, and the wide range of soil and climatic conditions under which it has been grown for hundreds of years, have caused to be formed a large number of races and types. These types are formed by adaptive modifications in response to some particular environment. Differences manifest themselves in habits of growth, form, size and colour of leaves, density of foliage, size, and succulence of stem, and in the colour of the flowers."[1]

As the anatomical structure of the seed coat is often of use in determining species, sections of *M. sativa*, L.; *M. falcata*, L. (yellow medic or lucerne); and *M. media*, Persoon (Sand lucerne), were examined, but no marked differences could be seen, so that the descriptions of the various layers of the testa refer to the three species. "Many writers regard *M. sativa*, *M. falcata*, *M. media*, as forming but one species, while others . . . . admit the forms indicated as varieties under one common species, and still others hold that all three are distinct. On the other hand, *M. media* is pronounced a hybrid between *M. sativa* and *M. falcata*. Whatever botanical view be taken, Stebler and Schroter very justly add that to the agriculturist the three forms of lucerne are very distinct, both in yield and suitability to environment."[2] The flowers of *M. falcata* are yellow; of *M. sativa*, prevailing colour blue; of *M. media*, lighter in colour and more yellow than *M. sativa*. The pods of *M. falcata* are straightly sickle-shaped, of *M. media*, forming about three-quarters of a coil, and of *M. sativa*, coiled two or three times. The same variations in the shape and colour of the common and Sand lucerne seeds are noticeable, although the former are larger, heavier, and brighter than the latter. The average size of the seeds of *M. sativa* is $2\frac{1}{2} \times 1\frac{1}{2} \times 1$ mm., and 1,000 seeds weigh about 2 grams, while 1,000 seeds of *M. media* weigh about 1·8 grams. In the germination tests, Sand lucerne and varieties of common lucerne were used, but not any yellow medic.

[1] Kansas Agricultural Experiment Station, Bulletin 155.
[2] Dictionary of Economic Products of India, Watts, Vol. V, p. 199.

Germination Tests.

Germination tests were carried out with nine varieties, the yellow and brown seeds of each variety being placed together in the same dish, being thus subjected to the same conditions.

	Montana.	Arabian.	Sand.	Tamworth Broad-leaf.	New Zealand.	Provence.	Turkestan.	Mudgee.	Tamworth Flats.
Yellow seed	90	94	96	89	82	93	98	100	85
Brown seed	19	6	6	33	69	17	74	94	78
Hard seeds, yellow ...	8	12	6	12	24	10	2	0	10
Hard seeds, brown ...	4	0	0	2	4	4	14	0	8

The average of the nine yellow tests ... ... = 92 per cent.
The average of the nine brown tests ... ... = 44 ,,
The average of four brown tests (5, 7, 8 and 9) = 79 ,,
The average of the yellow hard seeds... ... = 9·3 ,,
The average of the brown hard seeds ... ... = 4 ,,
In the yellow seeds the average (omitting hard seeds) failing to germinate ... ... = 1·5 ,,
In the brown seeds, average failing ... ... = 52·7 ,,

The Montana and Arabian seed was not as fresh as the Tamworth and Mudgee seed. Sand lucerne was from the United States, and the Turkestan was a direct importation, and re-machined by a Sydney firm.

In the Mudgee sample, 94 per cent. of the brown seeds germinated in three days, and only 74 per cent. of the yellow seeds in the same time. In the Tamworth Flats sample, 72 per cent. of the brown germinated in five days, and 74 per cent. of the yellow in the same time; but the shoots from the brown were more vigorous than those from the yellow. A similar result was obtained with the New Zealand seed.

In selecting the seed, any with signs of broken testas were rejected, and very few wrinkled seeds were taken. The smaller percentage of hard seeds in the brown is to be noted, and also the 24 per cent. of hard seeds in the New Zealand yellow.

Although precautions were taken to prevent the growth of fungi, it was noticed that the brown were more susceptible than the yellow, and this particularly evident with the brown of the Sand and Turkestan varieties.

The specific gravity of the yellow and brown seed was separately determined; but the results obtained—yellow 1·21 and brown 1·18—are too close to afford any practical means of separating the two in any sample.

Similar germination tests[3] on yellow and brown seed, carried out in the United States of America, gave the following results:—

Of 200 brown shrivelled seeds, practically none germinated in ten days. The plump seed of this sample (which contained 29 per cent. by weight of brown and shrivelled seeds, and at least two years old) germinated as follows:—

100 seeds—4th day, 56; 7th day, 23 (? 25). Total, 81 } Average, 80 per cent.
100 ,, ,, 63; ,, 16. ,, 79 }

[3] Texas Agricultural Experiment Station, Bulletin 109.

Another test of yellow and brown seeds resulted as follows :—

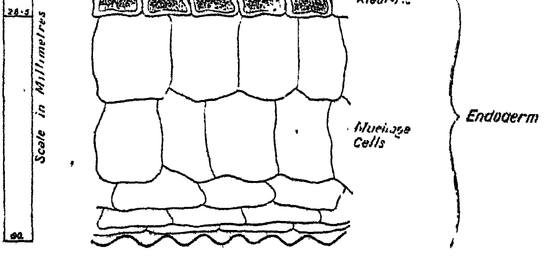
Yellow—100 seeds—Germinated at end of	1	week,	70	Average, 72 per cent.
,, 100 ,, ,, ,,	1	,,	75	
Brown—100 ,, ,, ,,	1	,,	17	Average, 14 per cent.
,, 100 ,, ,, ,,	1	,,	12	

Lucerne seed, when fresh and in good condition, is of a yellow colour with a greenish tint, full and plump, not shrivelled nor discoloured. The individual seeds vary from green through yellows to brown and black. "Immature seeds are a livid pea green. The seed gradually loses its lustre with age, and becomes dull brown to black, the intensity of the colour being a fair indication of the age."[4] There are certain other factors—chiefly at harvesting time—that influence the colour of the seed, *e.g.*, over-ripeness produces a brownish tinge, and exposure to sunlight, wetting, and sweating, and also heating, will give a brownish dead colour. As shown by germination tests, discoloration does not always mean impaired vitality; but in the selection of seed the predominance of dark seed points to either the seed being old or having been harvested under unfavourable conditions, and so likely to be poor in germination. Seed that is both brown and shrivelled should be rejected, as it is low in vitality.

Microscopic Tests.

The following notes, explaining the structure of the seed and showing the origin of colour, presuppose that the reader has some knowledge of botany:—

Microscopic examination of the testa shows a spermoderm and a well developed endosperm. The spermoderm has the several layers characteristic of a legume. The largest and most important layer in this is the *Palisade layer*—a layer one cell deep—to which the colour of the seed is due, and which in the case of most legumes is of considerable value, not only in determining that a leguminous product is present, but also in identifying a particular species. The yellow and brown testas agree in all cases, except as regards the contents of the cells of this layer, so that the descriptions of the various layers and cell structures refer to both. Following the Palisade layer is the *Hypoderm*—a layer one cell deep of peculiarly shaped cells, known by various names, *e.g.*, "column cells," "bearer cells," "hour-glass cells," and also of great value in the identification of leguminous plants. In many legumes these cells are empty; in the Bean (*Phaseolus vulgaris*, Metz.) they contain a large crystal of calcium oxalate, which helps to give rigidity to the cell; in Lucerne they have protoplasmic



Cross Section of Testa
X 300

[4] Texas Agricultural Experiment Station, Bulletin 81.

contents with prolongations into the grooves between the rib-like thickenings of the walls. Next comes the *Parenchyma* of several (about three) rows of empty cells with wavy walls, and flattened tangentially.

The Endosperm consists of two chief parts :—

1. The *Aleurone layer*—one cell thick, large cells with thickened walls, and a fine granular mass, with irregularly scattered larger granules, which give the microchemical reactions of starch.

2. The *Mucilage layer*—several cells thick, large cells with thin walls, the innermost being flattened tangentially, and the last layer being folded into numerous wave-like ridges.

The Endosperm, glassy when dry, clear and mucilaginous when wet, closely invests the cotyledons and extends between them and the radicle. These layers swell largely on the addition of water.

The cells of the Palisade layer are prismatic, about five times as long as they are broad (·03 to ·04 mm. long × ·007 to ·01 mm. broad). The walls are thickened, especially at the outer end, and the main lumen, broad at the inner end, is continued into cavities running into the outer end of the cell. The outer ends are bluntly conical and project into, and are bound together by, an outer surface layer or cuticle. Microchemical tests show that this latter layer consists of an outer part or true cuticle (staining green with chlorophyll, yellow with chloroiodide of zinc, &c.), and an inner part of hemicellulose, into which the cutinised ends of the palisade cells project. It is the presence of these cutinised parts that renders the testa impermeable to water, and produces our "hard seeds" in germination.

The colour of the seed is due to these palisade cells and their protoplasmic contents. In the yellow seeds the lumen contains a yellowish protoplasm, which is readily coagulated and stained by the usual reagents. The nucleus stains readily, and the whole contents are readily dissolved from the cell. When plasmolysed, the granular masses occupy small volume, having yielded up a large percentage of water forming part of the living protoplasm. In the palisade cells of the brown testa there is a change in the protoplasm. A large vacuole is a conspicuous feature in most of the cells. The protoplasm has hardened and contracted, and now forms an irregular mass adhering to the cell walls. It is now more resistant than in the case of the yellow protoplasm. Its resistance to acids and alkalies is greater, it is deep brown in colour, firmer, more opaque, and contains less water than the yellow. A somewhat similar appearance was produced in the yellow testas in the laboratory by continual heating and consequent drying above steam heat for several days. The nucleus of the brown cells is not so readily stained. The application of the Loew-Bokorny "Life Reagent" (an alkaline solution of silver nitrate, useful under certain conditions) gave a similar deposit of silver with both the yellow and brown protoplasm of the palisade cells.

Relation of Colour to Vitality.

The various shades of colour in the seed can be produced by different physiological conditions, and the gradual darkening of the colour with age is associated with the hardening and shrinking of the protoplasm, and its gradual loss of activity from the various changes which may be taking place in the composition of the proteids present, thus rendering the protoplasm functionless. If the embryo—especially its growing point—is living, the seed can germinate with the seed coats removed. That many of the yellow seeds swell and do not germinate is often due to the embryo being too immature, the seed having been gathered before having been sufficiently ripened. The smaller percentage of hard seeds among the brown may be accounted for by the greater strain on the cuticle, and the partial separation of the palisade cells during the contraction of the protoplasm producing minute cracks, thus allowing greater freedom for the entrance of water.

The Question of Storage.

As the market demands seed plump and bright, growers generally cut slightly on the green side, and the seed cures up to the right colour; and in order to sell at the best time, the seed is sometimes stored in air-tight iron

tanks. The success of this method will depend on the treatment of the seed previous to storing, and its results can best be measured by the germination of the seed after storage. What effects this storage has on the energy of germination and the vitality have not been determined here in the case of lucerne seed, but various experiments on numerous kinds of commercial seeds stored under trade conditions, and in open and sealed receptacles, either thoroughly dried, air dried, or with known quantities of moisture both in the seed and added, have led to the following conclusions :—

Moisture is the chief factor in determining the longevity of seeds as they are commercially handled. In moist atmospheres at low temperatures, germination is destroyed. In moist atmospheres, whether open or closed up, vitality is lost much sooner than in a dry atmosphere. Seeds, if well matured and thoroughly air dried, are not injured when kept at temperatures below 100 degrees F., whether they be kept in free communication with fresh air or sealed up. The water capable of being expelled at any given atmospheric temperature is driven off in a comparatively short time. This condition is practically completed in eight or ten days when maintained at that temperature. The storage place for seeds should always be dry. The temperature of storage should not be increased unless the seed is amply ventilated, so that the moisture liberated from the seed can be carried off readily.

It is of the utmost importance that the seed be dry before being sealed up in storage. The best method is to dry until no more moisture is given off at a temperature equivalent to the maximum of the place where the seeds are to be stored. If this is not done, any subsequent increase in temperature will liberate an additional quantity of moisture which, being confined, will leave the seeds in a humid atmosphere, and a rapid deterioration in vitality will follow. Changes may also occur in the colour of the seed.

Seeds under ordinary conditions of storage respire quite freely, and respiration is much more rapid if much moisture is present. Increase of temperature increases respiration. Respiration may take place as much in the dark as in the light. It is very intense if much moisture is present, and intensive respiration is accompanied by a rapid loss in vitality. By decreasing the water contents of seeds, respiration is reduced and vitality prolonged.[5]

Kolkwitz's experiments on barley[6] show what an important bearing the amount of water present has on the production of carbon dioxide. Seeds with 20 per cent. moisture gave twice as much and ten times as much CO_2 as those with 14 per cent. and 10 per cent. of moisture respectively. If the seeds be thoroughly dried, very little respiration takes place in storage.

Giglioni[7] experimented with lucerne seed and prevented respiration by storage in sealed tubes with various gases, and after about fifteen years obtained various germination results—one case giving 84 per cent. germination after sixteen years in carbon monoxide. He states that "the original

[5] Summaries from "Vitality and Germination of Seeds," Duvel, U.S. Bur. Plant Industry, Bul. 58. [6] Bericht. d. Deut. Bot. Ges., 19,285. 1901. [7] Nature, 52, 544. 1895.

dryness of the seeds and their preservation from moist air must be the very first condition for a latent secular vitality."

Lucerne seed—also perennial rye, oats, and turnips—when thoroughly dried, have retained their vitality even up to 212 degrees F.[8]

That storage in darkness or exposure to light influences the germination has been investigated by many workers. Jodin[9] denied that light affected either vitality or germination, while Laurent[10] states that it retarded germination and injured the vitality of the resting seed. Heinricher[11] says that "experiments indicate that the results in germination of such seeds as are helped by light depend upon the age of the seed, upon the quickness of drying after harvest, and whether this takes place in the light or darkness. Finally, the moisture content of the air during storage must be considered a factor. It is evident that the conditions are extraordinarily complex, and that conformity of results is to be expected only under the consideration of all these factors."

After exposing fresh yellow lucerne seed to sunlight for two months—Tamworth and Sand lucerne—a very slight change was noticeable. The seed was still yellow, but had lost a little of its bright lustre, being somewhat more dull than the fresh seed. On germination, this seed gave an average of 94 per cent., including one-third of the hard seeds, amounting to 7 per cent. The average of similar fresh seed was 92·5 per cent., with 9 per cent. of hard seeds. The moisture capable of being driven off from the yellow and brown seeds was also determined, but further tests are necessary before definite conclusions can be drawn.

Summary.

We might briefly review our knowledge as follows:—

There is some justification for the demand for bright golden seed. Although plump brown seed often germinates as quickly and as well as yellow seed, the average results are not so reliable. Colour is a guide to the age and vitality. Brown shrivelled seed should be rejected.

After harvesting, the seed should be thoroughly air-dried before marketing or storing. If it is to be stored in tanks, it should be dried for about a week, and the tanks should be clean and free from any mustiness and moisture from previously stored seed.

If the tanks are to be sealed up, thorough drying of the seed is essential to retain the vitality and colour.

Drying should take place at a temperature higher than any to which the seed will be subjected during storage.

The exposure (during the day and not at night) necessary to dry the seed will not injure the colour or vitality.

Local seed of good quality will give good crop results.

In buying seed, remember that "the best obtainable is never too good."

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[8] Nature, 64, 256. 1901. Dixon. [9] Compt. Rendu. T. cxxxv, 1229.
[10] Compt. Rendu. T. cxxxv, 1091, 1293. [11] Ber. d. Deut. Bot. Ges., 17, 308. 1899.

Drainage, and How to Construct Cheap and Effective Drains.

H. ROSS, Inspector of Agriculture.

MOST farmers have at some time or other experienced that badly-drained soils grow but indifferent crops. They are, as a matter of fact, not worth cultivating. The resulting crop is usually such a poor one that it does not pay to plough, cultivate, and sow this class of land unless it has been properly drained, notwithstanding that these undrained soils contain an abundance of moisture and a sufficiency of plant-food, though mostly in an unavailable form.

Advantages of Draining.

Drainage has an intimate relation to soil moisture. It is quite a false idea to hold that drainage dries a soil out; its effect is quite the contrary. It is only the superfluous moisture, which would otherwise remain stagnant in the soil, and prevent the free circulation of air, that is removed by drainage.

A well-drained soil, whether so artificially or naturally, acts as a reservoir for the storage of moisture. Such soils are porous and well aerated, and they are capable of holding more water in a capillary form than undrained soils.

Another advantage which drained soils possess over undrained soils is that plants grown on drained land are encouraged to root deeply, and are, consequently, better able to withstand adverse conditions. In undrained soils, the root system is shallow, thus limiting the feeding area of the plant. Furthermore, such soils are cold in the spring and the growth backward.

But, perhaps, the most important aspect of the drainage question is that relating to soil fertility. The soil contains millions of tiny forms of bacterial life, necessary to make certain essential plant-foods available. This bacterial life cannot exist and perform its functions except under certain conditions of warmth and air. In an undrained soil these conditions are not present, consequently badly-drained soils may be said to be "dead," whereas a sweet and more porous soil is teeming with these minute micro-organisms, which play such an important part in the production of growth.

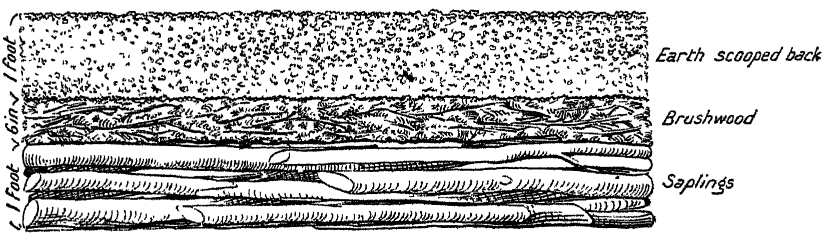
Surface drainage does not, as a rule, act as effectively as under-drainage. By employing under-drainage, the water, sinking through the soil by gravitation, carries with it a large mass of useful materials in the shape of plant-food, which, for the most part, remains when the surplus water is removed by drainage, to be afterwards made use of by the plants. Such, however, is not the case with surface drainage, where the surplus water, flowing near the surface, carries away with it particles of materials which might become plant-food, but are thus lost.

How to Construct Cheap and Effective Drains.

On many farms one finds patches of from 5 to 20 or more acres of undrained and sour land, which the farmer does not think worth cultivating, and which, in fact, if cultivated, would hardly give any return. Still these patches can easily be reclaimed, sweetened, and, by an inexpensive system of drainage, be made a source of profit and an asset to the farm.

Often farmers cannot afford a system of drainage with pipes or tiles, and frequently the value of the land does not warrant such an expenditure ; but cheap and thoroughly effective drains may be constructed in the following manner :—

After the natural fall of the land to be drained has been ascertained, a trench 1 foot wide and 2 feet 6 inches deep is dug. Into this trench, to a depth of from 9 to 12 inches, saplings of any length, from 4 to 6 inches in diameter, are thrown. On top of this is placed brushwood to a depth of about 5 inches, and then the excavated earth is scooped back level with the surface of the land, as shown in the sketch.



A cheap drain.

The water to be drained off will be found to percolate freely through the spaces between the saplings. The brushwood (bracken fern or similar undergrowth) prevents the earth from falling into the space filled with timber. As the earth is scooped back to a depth of 12 inches, the drains do not interfere with the ploughing, &c., whereas if the drains had been left open, they would hamper the working of the land. Besides this, the sides of open drains are constantly breaking loose, thus interfering with and blocking the watercourse.

The writer has at various times constructed drains of this description, which have invariably proved effective and durable, at a minimum expenditure.

Lice on Cows.

Several inquiries have been received in the Department lately for the best treatment of cows affected with lice—the Long-nosed Cattle Louse (*Haematopinus vituli*). In some cases the animals are stated to be losing condition and going off in their milk supply. A mixture of kerosene and soft soap well rubbed into the skin would soon have the effect of killing the lice. In the case of cattle that cannot be handled, spraying with or dipping in kerosene emulsion is recommended.

Analyses of Soils from Furracabad Estate, Glen Innes.

F. B. GUTHRIE.

SOME time ago, with a view to assisting the settlers on Furracabad Estate, near Glen Innes, the Department arranged with the Haymarket Permanent Land, Building, and Investment Company to have samples of soil taken for analysis from typical portions of the estate. Eight samples were taken by the Experimentalist of the Glen Innes Experiment Farm, and these may be fairly considered as representative of the soil on the estate.

The estate is on the New England tableland, about 3,500 feet above sea-level, close to the town of Glen Innes. The geological formations are basalt and a little granite and ironstone. Dairying is carried on rather extensively, and mixed farming is found to suit the district. English breeds of sheep thrive on the tablelands. Maize and some of the stronger wheats suit most of the soil, but on the black flats, oats are usually the most profitable crop. Clovers and a few introduced grasses, such as *Phalaris commutata*, grow exceedingly well, and will probably be planted extensively in the near future both as permanent pastures and in rotation.

Speaking generally of these soils, they are fairly heavy loams to clay loams, with, for the most part, a clay subsoil. The two soils marked H, Block 6, and H, Block 8, are of a somewhat different type to the others, and are poorer in plant-food, notably lime.

With these exceptions, the soils are all well supplied with humus, rich in lime, and fairly rich in the other elements of plant-food, and represent fertile soils which should require very little in the way of special treatment or manuring to ensure good crops of wheat, maize, oats, potatoes (on the lighter soils), and any fruit suited to the district. Their suitability for lucerne will depend largely upon the depth of the individual soil and the nature of the subsoil.

Table of analyses and discussion of the treatment best adapted for these soils individually are attached.

The Individual Soils.

H, BLOCK 6.—This is an extremely poor soil chemically, deficient in vegetable matter, and inclined to sourness. Its power of retaining water will be improved by growing a green crop, and ploughing it under to provide humus. Previous to the planting of the green crop the land should be limed at the rate of about half a ton freshly slacked lime per acre. This will sweeten the land, increase the yield of the green crop, and supply lime, in which the soil is deficient. After liming and green manuring to improve the

soil's mechanical condition, the crops will still require fairly heavy manuring, and the formulæ given in Bulletin 17 may be used. Failure to grow crops is due to—(1) sourness; (2) want of vegetable matter; (3) poverty of soil.

H, BLOCK 8.—The soil will be improved by thorough stirring to a good depth of 5 or 6 inches, and adding lime. This will sweeten the soil, which is inclined to be sour. Follow this treatment by green manuring, *i.e.*, ploughing under a green crop, such as cowpeas. After this the crop will require fairly heavy manuring, as it is not a very rich soil. See formulæ in Bulletin 17. Poorness of soil is the chief cause of want of good results, combined with absence of vegetable matter and tendency to sourness.

F 20, BLOCK 19.—This is a stiff soil, at present sour. It will require thorough stirring, with the addition of lime, to loosen and sweeten it. It may possibly require sub-draining to bring it into the best condition. The soil is rich in plant-food, extraordinarily so, considering the length of time it has been cultivated, and should require no manuring beyond a little superphosphate for cereals. Whether it is suitable or not for lucerne depends chiefly on the nature of the subsoil. If this is not too stiff it should do well enough, as the surface soil is quite adapted to lucerne.

F. 24, BLOCK 99.—This soil should give good results. It has all the characteristics of a fertile soil, and is well supplied with both humus and mineral plant-food. It is a fairly light, friable loam, of rather low water-holding capacity, but otherwise in good mechanical and chemical condition, and no special treatment nor manuring should be necessary for the first few years. Potatoes and other root crops, and, in fact, all crops or fruits suitable to the district, should do well. For potatoes the mixture recommended in Formula No. 15 should be suitable.

F 30, BLOCK 3.—This is a very rich soil chemically, well supplied with humus, and rich in plant-food. Its chief defects are its very stiff nature and present sour condition, due to insufficient cultivation. It should be well stirred to a depth of 5 or 6 inches, and limed at the rate of about ½ to ¾ ton freshly slacked lime per acre. This will both sweeten and lighten the soil. It should suit wheat well, or maize, but is probably less suitable for oats.

F 39, BLOCK 10.—This is a very stiff and shallow soil, and will require opening up and deepening in order to get the best results. It would be classified as good wheat land, but owing to the shallow nature of the cultivation hitherto adopted, would be likely to become exhausted unless deepened. The deepening should be done gradually by going a little deeper at each successive ploughing, and bringing a little of the subsoil up each time. The addition of lime at the time of ploughing will both sweeten the newly turned up stuff and lighten the soil. Chemically it is a fairly rich soil, and should require no other manuring for wheat than about ½ cwt. superphosphate per acre.

F 46, BLOCK 13, NO. 1.—This is a light friable loam, sweet, and fairly well supplied with plant-food. It should suit oats and maize very well. Its chief defect is its tendency to rapid drying, due to its openness and the gravelly nature of the subsoil. It might be found of advantage to increase the humus

Analysis of Soils from Furracabad Estate, Glen Innes.

Location.	Nature of Soil.	Nature of Subsoil.	Colour of Soil.	Reaction of Soil.	Capacity for Water.	Absolute Weight per Acre 6 inches deep.	Capillary Power.	Mechanical Analysis. Coarse Gravel more than 1-10 inch diameter.	Mechanical Analysis. Fine Gravel more than 1-50 inch diameter.	Mechanical Analysis. Fine Soil. Sand.	Mechanical Analysis. Fine Soil. Impalpable Matter, chiefly Clay.	Analysis of Fine Soil. Moisture.	Analysis of Fine Soil. Volatile and Combustible Matter, principally Organic.	Percentages of Fertilising Substances—General Value. Nitrogen.	Lime (CaO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).
					per cent.	lb.	inches.	per cent.	per cent.	per cent.	per cent	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
H, Block 6	Loam ... 8 inches.	Clay	Grey	Acid	41 (Fair.)	1,798,968	6·5 (Good.)	11·80	6·60	28·0	53·60	1·79	2·68	·042 (Deficient.)	·066 (Indifferent.)	·089 (Fair.)	·071 (Fair.)
H, Block 8	Loam ... 9 inches.	Clay	Chocolate ...	Acid	36 (Fair.)	1,866,853	Over 9 (Excellent.)	5·20	36·20	22·30	36·30	6·37	7 39	·133 (Satisfactory.)	·168 (Satisfactory.)	·068 (Fair.)	·175 (Satisfactory.)
F 20, Block 19	Clay ... 1½ inches.	Clay	Dark	Strongly acid.	49 (Good.)	1,595,310	3·6 (Fair.)	....	1·20	13·0	85·80	8·97	13·17	·119 (Satisfactory.)	·553 (Very good.)	·079 (Fair.)	·502 (Very good.)
F 24, Block 99	Loam ... 6 inches.	Clay and stone.	Reddish brown	Acid	31 (Low.)	1,459,539	5·3 (Good.)	3·40	6·0	24·30	57·50	8·17	11·60	·084 (Fair.)	·685 (Very good.)	·137 (Satisfactory.)	·081 (Fair.)
F 30, Block 3	Clay ... 2 inches.	Clay	Black	Strongly acid.	27 (Very low.)	1,425,596	4 (Fair.)	....	1·20	11·0	87·80	14·02	14·57	·168 (Good.)	·734 (Very good.)	·128 (Satisfactory.)	·671 (Very good,)
F 39, Block 10	Heavy loam 3 inches.	Clay	Dark	Acid	47 (Good.)	1,595,310	Over 9 (Excellent.)	2·0	4·60	20·0	73·40	9·45	10·93	·147 (Satisfactory.)	·352 (Good.)	·098 (Fair.)	·242 (Good.)
F 46, Block 13, No. 1... ...	Loam ... 4 inches.	Gravel... ...	Chocolate ...	Acid	43 (Fair.)	1,968,682	Over 9 (Excellent.)	8·0	12·60	35·0	44·40	5·79	8·62	·056 (Fair.)	·465 (Good.)	·108 (Satisfactory.)	·138 (Satisfactory.)
F 46, Block 13, No. 2... ...	Clay ... 6 inches.	Clay	Dark	Strongly acid.	48 (Good.)	1,561,368	4·9 (Fair.)	3·6	3·20	13·0	80·20	7·72	11·89	·056 (Fair.)	·221 (Good.)	·079 (Fair.)	·277 (Good.)

content by ploughing under a green crop. This will render it retentive of moisture, and prevent its drying off too rapidly. It will not require heavy manuring. The formulæ recommended for oats and maize and potatoes, in Bulletin 17, may be used, in rather smaller quantities than there recommended. It should suit oats, maize, and potatoes well; probably less suitable for wheat.

F 46, Block 13, No. 2.—Very stiff soil, at present sour; wants thorough cultivation and the addition of lime at the rate of $\frac{1}{2}$ to $\frac{3}{4}$ ton freshly slacked lime per acre. This will open the soil up and let the water get away. If soil is still wet after this, it may be necessary to drain. Should be good wheat land, and should require little manuring for a few years but about $\frac{3}{4}$ cwt. superphosphate per acre. Less suited to potatoes.

Killing Quarrians and Galahs.

These birds are great pests to the western wheat-grower. According to Mr. T. Bragg, of Mungeribar, they are best killed at wheat-seeding time. He recommends that 12 lb. of wheat be soaked in fresh milk; then shake on 10 oz. strychnine, and mix by hand. The mixing should be done in the field, and the grain immediately spread over the surface. Mr. Bragg has tried many other methods, but he has never had any trouble from quarrians and galahs since operating in this way.

The same method may be adopted for destroying sparrows; but the sparrow is somewhat more cunning than the other birds, and the poisoned grain needs to be spread about 50 yards from the trees or sheds that the sparrows haunt. Apparently, on the first feeling of sickness, a sparrow flies to shelter. Should the poison be so strong that the sparrow falls dead where he has been feeding, the other sparrows will desert that particular locality for weeks. —Mark H. Reynolds, Inspector of Agriculture.

A Reminiscence of the late William Farrer.

In 1878, Mr. Farrer was surveying on the Macquarie River. In that year there was a very severe drought in the west. Mr. Farrer, who was even then interested in agriculture, distributed seeds of Johnson grass to Mr. W. Baird and others, on account of its quick-growing properties.

The year 1879 was a very wet one, and rust was prevalent in the wheat crops of the west. Mr. Farrer introduced from America (according to Mr. Baird) a wheat called Pugh's Rust-proof, which he distributed to a few of his friends—one farming in the Allora district of Queensland. This man made a considerable profit out of the wheat for a few years, obtaining as much as 8s. 6d. per bushel for the seed. The name Pugh's Rust-proof was dropped, and the wheat became known as Allora Spring.—Mark H. Reynolds,

Irritation of the Skin by the Common Ivy.

(*Hedera helix.*)

J. H. MAIDEN,
Government Botanist, and Director, Botanic Gardens, Sydney.

IF readers will turn to my second article on "Some Plants which cause Inflammation or Irritation of the Skin" in the *Gazette* for December, 1909, p. 1073, they will see that a brief statement of some cases in which the Common Ivy is a skin irritant is given. Since that statement was published, several people have written to me or visited me, stating that this might give a clue to skin trouble whose origin was mysterious, but only in three cases did my visitors feel sure that the cause was the Common Ivy. As a matter of fact, when cases of ivy poisoning are reported to me, the plant generally looked for is the so-called Poison Ivy referred to in the *Gazette* for February, 1909.

The matter has now been claiming some attention in England, and following are some instances of skin poisoning by the Common Ivy:—

Two of the young gardeners here were recently engaged in trimming the ivy which grows on the walls of the mansion, and two days afterwards both complained of skin trouble. In appearance they were suffering from a rash such as would be caused by a bad nettle sting. One man recovered in a day or so; the other has been, and is still, covered from head to foot with great sores, and is in a sorry state to look at. His head, arms, and legs are all attacked, and he is quite unable to resume work. A doctor who has attended him states that he has been poisoned through cutting the ivy. Is this of rare occurrence? I have never known such a case before, and should be greatly interested to know if others have any such knowledge.—B. J. MERCER, Wierton Place Gardens, Maidstone. (*Gardeners' Chronicle*, 4th March, 1911, page 139.)

Having read the paragraph on page 139 respecting a case of poisoning by ivy, I wish to give my experience of a similar case. Having a good deal of ivy about my garden, I instructed a jobbing gardener to cut it, which he did, but to my horror the poor fellow looked as though he had been stung by a hive of bees, and he said he was affected all over. Never again will I allow him to touch ivy. He was a new hand, and a healthy-looking young man.—M.E.T.

I was much interested in the note upon skin poisoning by ivy. Some years ago, after cutting ivy, I was troubled with exactly the same kind of thing, namely, irritation of the skin on face, head, and forearm, which eventually broke out in large sores. I suffered more particularly round my eyes and on my forehead. This kind of thing happened two years in succession, although not quite so severe the second season as the first. I have trimmed ivy on a great many different occasions, but have never felt any ill effects excepting the two occasions already mentioned, when, I might add, I was engaged at the work for ten days at a stretch. The trouble commenced after the second day, and was probably aggravated by my continuing the work. I have never known anyone in these gardens or elsewhere to be troubled from the same cause.—W. C. LEEKE, Ryhall Hall Gardens, Stamford. (*Gardeners' Chronicle*, 11th March, 1911, page 157.)

The matter is of some importance to us, since ivy is so much cultivated in New South Wales, and rightly so; and I should be glad to learn the experience of readers of the *Gazette* in the matter. It is very certain that the vast majority of persons receive no harm from ivy. But there is no reasonable doubt that it injures some people, and these persons may be thankful to be put on their guard in the matter. Up to the present, I do not know any case of ivy poisoning except on the part of persons who have actually cut the ivy, or who have handled it shortly after cutting.

Since the above was written, a large number of persons have called on me, or written to me, giving me instances of people in New South Wales who have suffered more or less skin irritation through handling the Common Ivy.

Fruit for Export.

UNDER the Commerce (Trade Description) Act, the exportation of certain goods is prohibited unless there be a trade description upon the packages, and fruits, both fresh and preserved, are included in the schedulé. Under the Regulations the trade description to be applied must be in the form of a label or brand, displaying in legible characters a true description of the goods, the name of the State in which the goods were produced, and the word "Australia."

In the case of fruit, where the package contains fruits of various sizes, the trade description shall include the word "unsorted." In the case of apples under 2¼ inches in diameter, the trade description shall include in bold and legible characters the words "under 2¼ inches."

Apparently it is intended that, when fruit is of even size and quality, which can be regarded as first-class, it may be shipped so long as the requirements of the Regulations have been complied with. Where a shipment is of inferior, unsound, or abnormal-conditioned fruit, the trade description must be in accordance with facts; otherwise the export may be prohibited; and a *declaration by the exporter* shall accompany the notice of intention to export, stating, in the case of fruit affected by disease, to what extent it is so affected, and, in the case of apples under 2¼ inches in diameter, that fact.

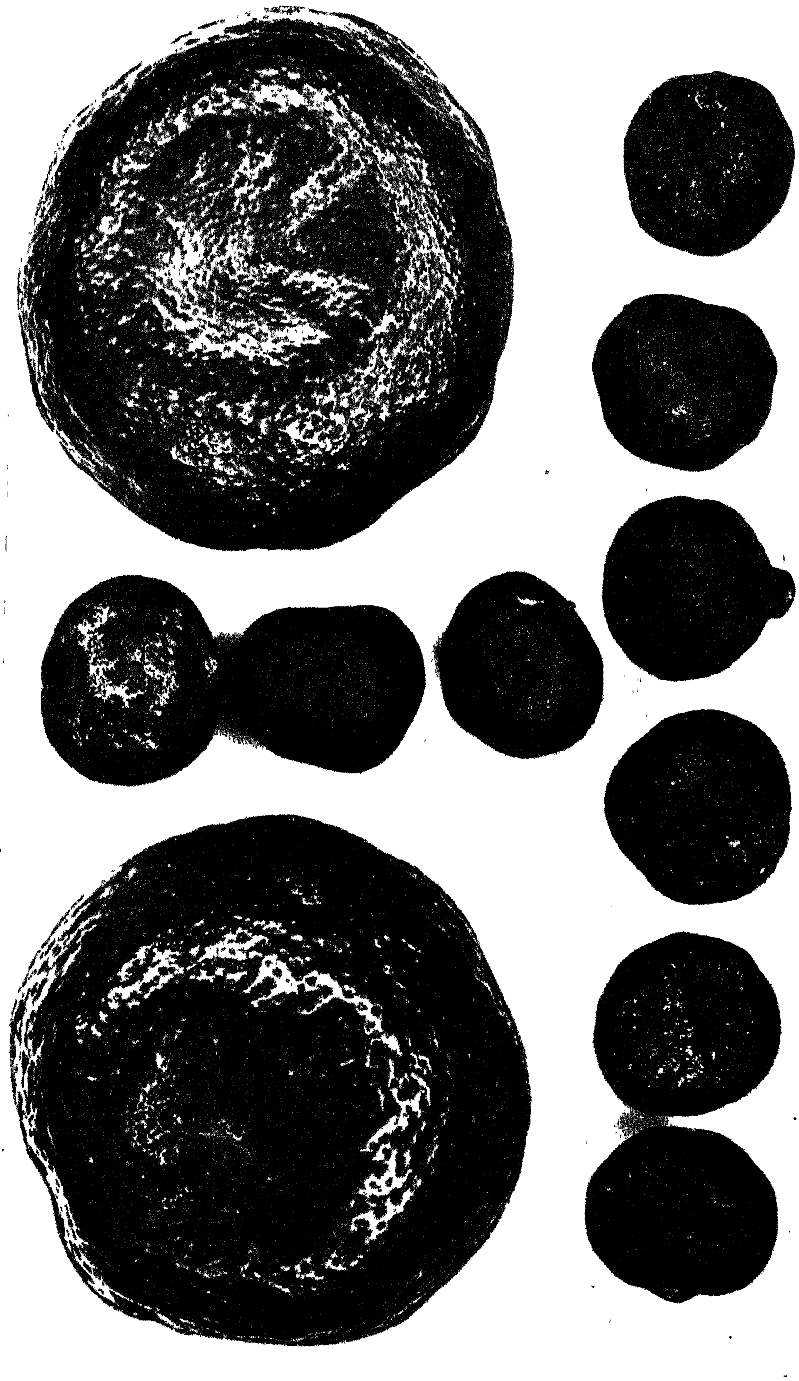
The inspectors have at times unusual difficulties to contend with in consequence of the extraordinary poor quality of fruit which some persons may tender for shipment, as the illustrations show.

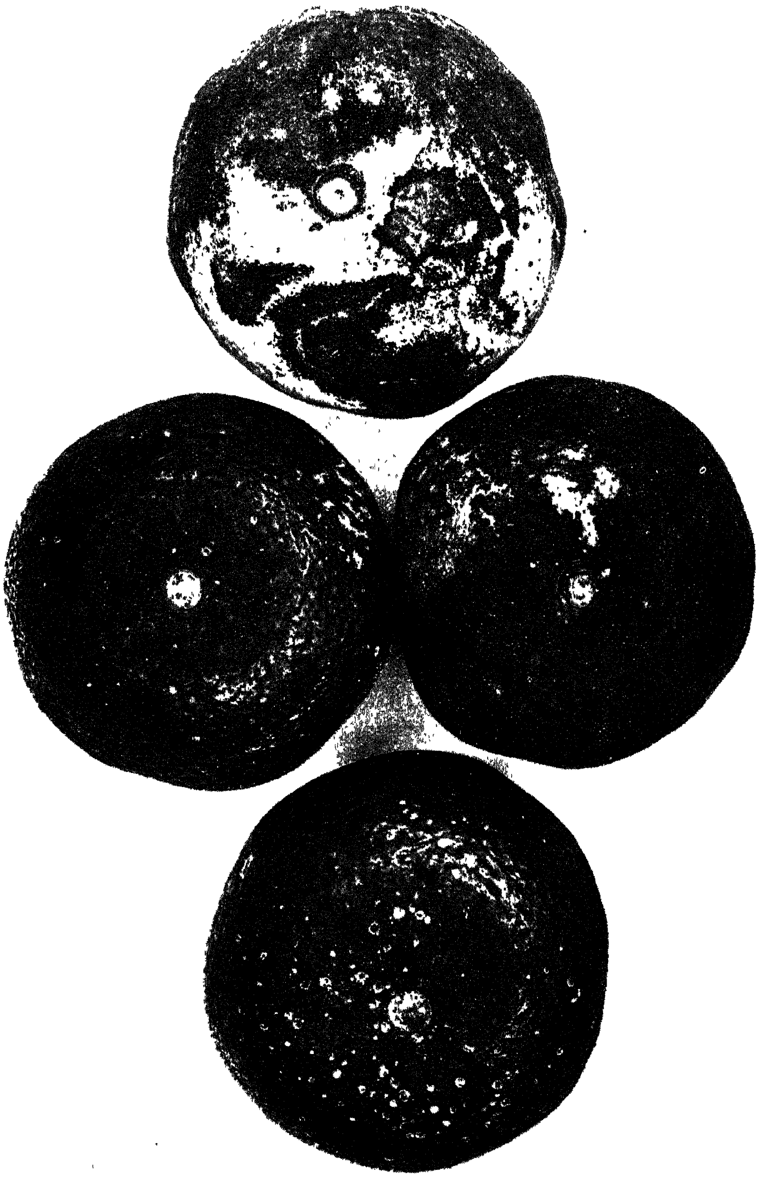
AVERAGE RAINFALL TABLES.

THE Commonwealth Meteorologist has now issued revised tables showing the average rainfall for each month of the year at 204 stations throughout New South Wales. These tables are brought up to date, and the averages are taken over varying periods up to fifty-two years, according to the length of time for which observations have been recorded.

Of course seasons vary from year to year, so that these averages cannot serve as an exact indication of the amount of rain to be expected in any one month in a particular locality; but as they are carried over a great number of years, they should prove as good a guide as it is possible to obtain. Moreover, as they show the proportionate quantity of the annual rainfall received in any one month or season, they should help farmers considerably in deciding whether particular crops are worth trying in their districts.

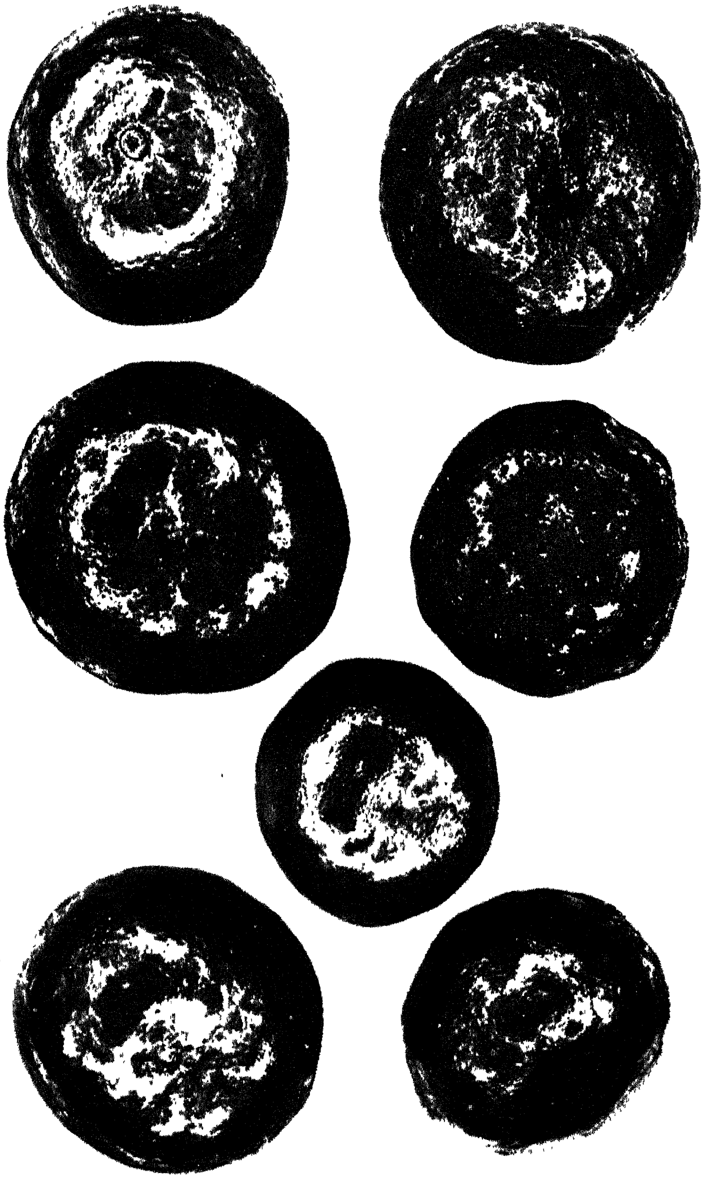
Copies of the tables may be obtained from "The Divisional Officer, Weather Bureau, Sydney," price 6d. each.





DISEASED FRUIT SUBMITTED FOR EXPORT.

Oranges affected with scale and mildew taken from a case [illegible]



UNEVEN AND DISEASED FRUIT SUBMITTED FOR EXPORT.

Mandarins submitted for export; uneven in size, and more or less affected with scale and mould.

Red Oil Spray for Fruit-Trees.

RED OIL EMULSION FOR WOOLLY APHIS ON APPLE-TREES.

W. H. GRANT, Orchardist, Bathurst Experiment Farm.

EXPERIMENTS with red oil spray against woolly aphis were made in this orchard during the season 1911. The brand of oil used was Neptune Red Oil.

The first spraying was carried out during the second week of March, when, owing to the warm, dry weather, the aphis were beginning to make headway. The strength used on this occasion was:—

2 gallons red oil.
2 lb. hard soap.
100 gallons water.

Owing to the heavy foliage on the trees at this time, the result was not as satisfactory as it might have been under more favourable conditions. Where the spray hit the aphis it cleared it out, but the missed patches began to spread again in a few weeks.

Until spraying with red oil at this time has been further tested it cannot be recommended for extensive use. There is too much danger of burning the fruit. Even at the strength put on here—one in fifty—some of the leaves came off.

The second spraying was commenced during the second week in May, and the strength of the spray was increased to—

4 gallons Vacuum Red Oil.
3 lb. soap.
100 gallons water.

The decreased quantity of soap was as efficient as the 1 lb. to the gallon. One lot was made with only 2 lb. of soap to 4 gallons of oil, but that strength is likely to cause trouble if not carefully mixed.

When this spray was applied the leaves were very thin, owing to the early frost, and consequently all the aphis were exposed.

The increased strength was very apparent in results. The aphis were completely cleaned out, and the trees left with a clean, healthy, oily appearance. This is, in my opinion, the ideal object to be attained in spraying for woolly aphis, as the oily surface offers no refuge to any new brood aphides which may come from other infested trees. Except in a few instances, the aphis have not made their reappearance.

One great advantage of red oil over other sprays is that it will penetrate into crevices where the spray may not have actually hit.

As there appears to be a general dislike throughout the State for red oil on account of the bad reports sent in by some growers—which, I think, have in every instance been traced down to bad mixing—the following descrip-

tion is given of a mode of preparation which may be followed with much more success:—

Cut 3 lb. of hard soap into about 5 or 6 gallons of water. Boil thoroughly till the soap is dissolved—say, ten minutes—and when the soapy water is boiling add the oil *quickly,* agitating for a couple of minutes.

It is absolutely essential that the oil be put in all at once, not in small quantities. An ordinary chipping hoe is the best agitator that can be procured. Spray made in this manner should be a deep yellow colour, and absolutely free from all traces of free oil. When diluted it should be a creamy white.

Dilute with warm water when possible, or with cold water if the mixture is to be used immediately, as when left standing for any time the spray thickens. This can be heated up again without destroying the efficiency of the spray.

It is advisable not to make a stock solution. The mixture should be applied the same day as made. One of the most important factors in oil-spraying is to keep the mixture well agitated in the pump whilst spraying.

Kerosene emulsion was also used, but with very disappointing results. The spray killed the aphis where it actually hit them, but would not penetrate at all. A few days after the spray was applied the trees were nearly as bad as before. The oily deposit left by red oil is entirely absent in kerosene emulsion. The strength used was:—

4 lb. hard soap.
5 gallons kerosene.
100 gallons water.

As a spray for woolly aphis it cannot be recommended.

RED OIL FOR SCALE ON CITRUS TREES.

O. BROOKS, Fruit Inspector, Gosford.

A GREAT number of orchardists in my district have used red oil and soft soap spraying mixture this season for Red Scale, Olive Scale, and White Louse on citrus trees. The proportions used by most growers were:—1 gallon of oil, 2 lb. soft-soap, 30 gallons water. This was found to be most effective in killing the scale insects, but in some instances where the trees had been sprayed a few weeks before with soda-wash for Indian wax scale, the red oil did considerable damage to the trees, burning the wood and causing the fruit to fall badly. It is very evident that red oil should not be used after soda-wash, as the soda has a tendency to dry the sap from the tree and weaken it.

I would suggest that if red oil is used for citrus trees, 1 in 35 would be strong enough to kill the scale without injuring the trees, although if the trees are heavily laden with fruit, or in a weak state through poverty or scale, two sprayings at a weaker strength would be advisable.

I have noticed that red oil spray is very effective for woolly aphis and San José scale on apple trees, &c. The proportion generally used is 1 in 30.

Export of Apples from Bathurst Experiment Farm.

DURING the past two seasons, trial shipments of apples have been made from Bathurst Experiment Farm to test markets in other parts of the world. The results so far are now published for the information of growers. It will be noticed that in several instances account sales have not yet been received. Particulars of results of these shipments will be published when available.

SHIPMENTS TO JAVA.

Account sales have been received of several shipments forwarded last year and this year to Java through the agency of the Java Cold Storage and Eastern Trading and Agency Company, Limited, 20, Loftus-street, Sydney.

The apples were graded into "extra choice," "choice," "specially selected, and "selected," and packed in the usual way for export.

The First 1910 Shipment.

The first consignment consisted of 100 cases—30 Jonathan, 40 Five Crown, 15 Rome Beauty, and 15 Munroe's Favourite. These were despatched per s.s. "Mataram" on 1st March, 1910. The following report was received from the Batavian office of the Company :—

This consignment of apples arrived in splendid order, and we found the varieties suitable for this market. The Rome Beauties were particularly good, also the Five Crowns. After being kept in the cool-room for a week or so, a number of the Jonathans showed signs of being affected by codling moth, but otherwise no fault could be found with any of the apples. Recognising the importance of obtaining a good advertisement for New South Wales fruit, we distributed a few cases among the prominent people in Java, and sold the shipment in lots of one case at a time, by which we, of course, secured much higher prices than we would have done had we sold the goods in larger lots. At present the market here is glutted with inferior apples from Australia, some of which are being sold down to as low as 5 guilders (8s. 4d.) a case, duty paid and delivered.

The cases sold, 94½, realised approximately £77 19s. 6d., an average of 16s. 5d. per case. The charges amounted to £40 19s., leaving a balance or net proceeds of £37 0s. 6d., an average of 7s. 10d. per case. The following statement shows the items :—

		£	s.	d.
DR. 1910.				
Feb. 26.—To	Rail freight from Bathurst (100 cases)	1	19	2
	Cartage to steamer	0	9	0
	Steamer freight	13	6	11
	Insurance and bill of lading...	0	6	11
	Commission *del credere* (15 per cent.)	11	13	11
	Storage, freight, cartage, &c., Java	6	14	4
	Customs duty	6	6	0
	Difference in Exchange	0	2	9
		£40	19	0
CR. April 30.—By	gross proceeds (95½ cases)	77	19	6
	To Balance, being net proceeds	£37	0	6

Second 1910 Shipment.

The second consignment of 200 cases contained 45 cases of Stone Pippin, 148 cases of Munroe's Favourite, 4 cases Ben Davis, and 3 cases Buncombe. These went forward on 30th April. The following is the report of the agents at Batavia:—

As regards the varieties shipped, the Munroe's Favourites and Stone Pippins opened up in perfect order. The first was very carefully packed and classed, and, so far, we have found very few damaged apples in either of these kinds.

The Buncombe and Ben Davis were of good colour, but too soft for this market, as they will only keep for a few days after being taken out of the cool rooms.

We forwarded a sample case *ex* this consignment to the Governor-General of the Nederlands Indies. We are making sales of these apples at from 7 to 8 guilders per case.

Of these 200 cases, 3½ went bad, and four cases were distributed as samples. The balance (192½ cases) realised £141 0s. 2d., an average of 14s. 7·7d. per case. The charges amounted to £73 9s. 11d., leaving a balance or net proceeds of £67 10s. 3d., an average of 7s. 0·1d. per case. The following is the statement:—

			£	s.	d.
Dr.	1910.				
	April 28—To	Rail freight from Bathurst	2	12	0
	,, 29	Cartage, rail to steamer	0	15	0
	,, 30	Steamer freight to Java	21	17	6
	,, 30	Bill of lading and entry	0	2	6
	,, 30	Insurance	0	8	9
	May 23	Customs duty, Java	12	12	0
	,, 23	Storage charges	6	0	10
	,, 23	Clearing, rail freight, &c.	5	18	9
	,, 23	Advertising	0	16	8
	,, 23	Sundries...	0	8	6
	,, 23	Commission *del credere* (15 per cent.)	21	3	0
	,, 23	Exchange on draft (1 per cent.)	0	14	5
			£73	9	11
Cr.	Sept. 15—By	gross proceeds	141	0	2
		To Balance, being net proceeds	£67	10	3

Third 1910 Shipment.

This consignment was taken from cold store and forwarded on 31st August, 1910. It comprised 200 cases, of which 160 were Stone Pippins and 40 Granny Smiths. Of these 19 cases turned out rotten, and 1¼ cases were distributed as samples. The balance, 179¾ cases, realised £135 3s. 4d., an average of 15s. 0·4d. per case. Charges amounted to £64 17s. 10d., leaving a net return of £70 5s. 6d. This is equal to 7s. per case on the 200 cases forwarded.

			£	s.	d.
Dr.	1910.				
	Aug. 31—To	Cartage, cold stores to steamer	0	15	0
	,, 31	Insurance	0	6	3
	,, 31	Freight	21	17	6
	,, 31	Bill of lading and entry	0	2	6
		Batavia duties	9	0	0
		Clearing, rail freight, and coolie hire	5	16	8
		Insurance, ¼ per cent....	0	2	3
		Interest on expenses	0	3	10
		Storing 200 cases	5	8	4
		Advertising	1	0	0
		Commission *del credere* (15 per cent.)	20	5	6
			£64	17	10
Cr.		By gross proceeds	135	3	4
		To Balance (net proceeds)	£70	5	6

Shipments in 1911.

A consignment of 100 cases was shipped per s.s. "Guthrie," on 1st April, 1911, but account sales have not yet come to hand. Another shipment was made per s.s. "Mataram," on 1st May, consisting of 39 cases Granny Smith, 52 Stone Pippin, and 9 Rome Beauty, with the following results:—

	£	s.	d.
Dr.			
To Rail freight - Bathurst to Sydney ...	1	19	2
Cartage in Sydney ...	0	9	0
Freight ...	10	18	9
Bill of lading and entry ...	0	2	6
Clearing, rail freight, and coolie hire ...	3	0	0
Marine insurance ...	0	4	9
Duties ...	4	10	0
Storage ...	4	8	2
Insurance ...	0	1	5
Advertising ...	0	16	8
Small outlets ...	0	3	6
Interest on expenses ...	0	3	8
Commission *del credere* (15 per cent.) ...	13	4	0
Exchange (1 per cent. on £50) ...	0	10	0
	£40	11	7
Cr.			
By gross returns ...	88	0	0
To balance (net returns) ...	£47	8	5

The average gross price received was 17s. 7·1d. per case; the expenses amounted to 8s. 1·3d. per case; leaving the net proceeds, 9s. 5·8d. per case.

A third 1911 shipment was made on 1st June, 1911. No returns have yet been received.

Summary.

It will be seen from the above figures that the charges incurred in exporting our apples to Java are very high. Nevertheless, the net prices received have been uniformly 7s. per case or upwards. As the Eastern markets are enormous, these figures indicate that there is no danger of over-production of apples in this State when once the export trade is properly organised.

SHIPMENT TO LONDON.

By the s.s. "India," sailing 8th March, 1911, 470 cases of apples and 9 cases of pears, from Bathurst Experiment Farm, were forwarded to the Agent-General in London for disposal. In order to compare the prices at Covent Garden and Monument Markets for New South Wales apples, Mr. Coghlan sent 200 cases of apples to Messrs. Edward Jacobs and Sons, Covent Garden, and the balance, 270 cases of apples and 9 cases of pears, to Messrs. Keeling and Hunt, Monument Square.

The prices received at Monument Markets for unbroken cases ranged from 10s. to 12s., whilst those at Covent Garden ranged from 10s. 6d. to 14s. Messrs. Jacobs and Sons, however, removed decayed apples from certain cases and replaced them by sound fruit, being thus in a position to offer the consignment under more advantageous circumstances.

Most of the pears arrived in a rotten condition. Messrs. Keeling and Hunt recommend that pears be packed in trays, not more than 20 in one

compartment, each tray 1 pear deep, and each tray having two compartments. These trays can then be fastened together to form a little crate, the number of pears in the crate being marked outside. Each pear should be wrapped in white tissue paper, and nested in wood-wool. The 9 cases only realised £2 3s. 9d., but two cases of Packham's Triumph brought 11s. each.

The charges made by Messrs. Jacobs and Sons were :—

	£	s.	d.
Disbursements and charges	4	3	4
Commission, 5 per cent.	5	17	10
	£10	1	2

And by Messrs. Keeling and Hunt :—

	£	s.	d.
Ordinary size packages	13	19	5
Extra, to cover Port of London rate	0	10	0
Packages on show	0	6	0
Brokerage and guarantee	2	19	6
	£17	14	11

The net amounts realised were £131 4s. 10d. from Monument Markets and £107 15s. 7d. from Covent Garden—total, £239 0s. 5d. for 479 cases of fruit. But freight would need to be deducted.

SHIPMENT TO LIVERPOOL.

Mr. M. G. B. Jefferson, of 196, Sussex-street, Sydney, took delivery of 100 cases of Bathurst Farm apples, and forwarded them per s.s. "Hector," on 7th April, 1911, to Messrs. Fred. Pritchard & Co., 6, Sir Thomas street, Liverpool, for sale. The varieties were :—

Rome Beauty	50 cases.
Granny Smith	40 „
Stone Pippin	10 „
	100 „

The average prices realised were :—

	s. d.
Rome Beauty	8 10 per case.
Granny Smith	8 2 „
Stone Pippin	8 3 „

The apples arrived on a somewhat depressed market, owing to supplies from all sources on the English and Continental markets being heavy. The gross proceeds from the shipment were £37 8s. 3d., and the charges, including rail freight from Bathurst to Sydney, £16 13s. 3d., leaving net proceeds £20 15s. This is equivalent to a net price of 4s. 1·8d. per case.

SHIPMENT TO HAMBURG.

Mr. Jefferson also forwarded 100 cases of apples and pears from Bathurst Farm to Messrs. Timm and Gersterkorn, Hamburg, Germany, per s.s. "Grosser Kurfurst," on 25th March, 1911. The varieties were :—

Apples—Jonathan	50 cases.
Five Crown	20 „
Rome Beauty	10 „
Granny Smith...	10 „
Rymer	4 „
Delaware Red Winter	1 „
Kentucky Red Streak	2 „
Pears—Packham's Triumph	2 „

The following prices were realised for the varieties shipped :—

	Marks.	s.	d.
Apples—Jonathan	11·75	11	6
Five Crown...	......	......	
Rome Beauty	9·35	9	4
Granny Smith	13·70	13	6
Rymer	9·00	9	0
Delaware Red Winter	9·00	9	0
Kentucky Red Streak	7·00	7	0
Pears—Packham's Triumph	7·00	7	0

The gross proceeds were 1,136·40 marks, and the charges in Germany as follow :—

	Marks.
Ship's quay dues and stamp	3·50
Landing, wharfage, cartage, housing, rent, labourage, inspection fee, &c.	51·30
Maritime insurance...	14·00
Petty expenses	32·00
Commission and *del credere*, 5 per cent....	56·80
Examination...	10·00
Bank commission	3·20
	170·80

This leaves net proceeds in Germany 965·60 marks, or £47 2s.

The following deductions have then to be made :—

	£	s.	d.
Rail freight	1	19	2
Cartage to steamer	0	8	4
Ocean freight	16	8	2
Bill of lading and stamps	0	1	0
	£18	16	8

The net proceeds at the Farm are, therefore, £28 5s. 4d., equivalent to 5s. 7·8d. per case.

SHIPMENT TO VANCOUVER.

Messrs. H. Bleakley & Co., of 55, Pitt-street, Sydney, took 300 cases of Bathurst Farm apples and forwarded them per s.s. "Zealandia," on 10th April, 1911, to Messrs. Shallcross, Macauley, & Co., Vancouver. The fruit was carried as ordinary cargo (not in cool store). The varieties were Rome Beauty, 168 cases; Granny Smith, 121 cases; and Stone Pippin, 11 cases. The prices realised ranged from \$2·70 to \$3·40 per case, but 36 cases were lost in repacking. The total proceeds were \$806·45. The Vancouver charges were :—

Commission, 7½ per cent.	\$60·50
Wharfage	6·25
Cartage	4·00
Duty, inspection, &c.	50·75
	\$121·50

The return was, therefore, $684·95. Exchange amounting to $4·89, the net result at Vancouver was £140 1s. 5d. The charges here were:—

	£	s.	d.
Rail freight to Sydney...	3	15	10
Cartage	1	4	0
Steamer freight..	25	0	0
	£29	19	10

Deducting this from £140 1s. 5d. leaves £110 1s. 7d., or a net return at Bathurst of 7s. 4d. per case.

The agents strongly recommend that refrigerator space be obtained for apples shipped to Vancouver, as the difference in price received would more than compensate for the extra freight charge.

Stallion Parade Cards.

The Corowa P. A. and H. Society has adopted the following entry card for Stallion Parades. The veterinary officers consider it an excellent idea, saving a lot of time to the examining officer. The card is about 6 inches by 4 inches:—

Corowa Pastoral, Agricultural, and Horticultural Society.

VETERINARY EXAMINATION AND STALLION PARADE.

ENTRY TICKET.

Name of Owner ....

Address..

Name of Horse ....

Age .... years. Height .... hands.

Pedigree { Sire ....
{ Dam ....

Description ....

....

....

Breeder's Name ....

Prior Owner's Name ....

....

....

....

....

The only suggestion which the veterinary officers can make is, that the class of animal be inserted on the card, *i.e.*, blood, trotter, &c.

These cards are of great assistance to the examining officer, who can fill in any further particulars he requires. The Stock Branch would be pleased if other societies would adopt the idea.

The Peach.

W. J. ALLEN.

Peach-growing as an Industry.

In this State, peach-growing has been found one of the most profitable branches of the fruit industry. This result is due to the suitability of our climate and soil, and to the rapidity with which the peach-tree reaches maturity. It commences to bear about the third year.

The peach will thrive in more varied climates than most other fruits, notwithstanding the fact that it is practically a semi-tropical tree. It can be grown on the higher levels, where it does equally as well as in the coastal districts. Although it is not a tropical fruit, and therefore unsuitable for the extreme north-east of New South Wales, still its wonderful adaptability enables it to withstand the variations in temperature and rainfall to which the bulk of the State is more or less subject.

Peaches are grown for dessert, canning, and drying. Different varieties are found best for the different purposes. The early peach is usually a purely dessert fruit, and is of very little value for either canning or drying, while many of the midseason to late varieties are suitable for all purposes. The late clingstone, with no colouring around the stone or through the flesh, is usually considered the best for canning, while the highly-coloured, yellow-fleshed freestone is sought after for any purpose—drying, canning, or dessert. For drying alone, a yellow-fleshed freestone variety is the most suitable.

Choice of Locality.

Peaches are grown successfully in most parts of New South Wales. In the extreme north-eastern corner, peach-growing has not been found profitable; and on one or two of the very high levels, such as the Southern Alps, owing to the occurrence of heavy frosts in almost any month of the year, the prospects of getting a crop are not bright. With these exceptions, peach-growing can be undertaken with reasonable chance of success in almost any part of New South Wales. Of course, in the very hot and dry portions of the interior, irrigation is necessary.

In the colder climates, peach orchards should never be planted in low-lying land or gullies, but on hills or high elevations, so as to provide good air drainage and be out of the frost level. It is well known that frosts do the most damage in gullies and low-lying places, but along the banks of most of our coastal rivers there has been no injury from frost; although these places are low-lying, some of the best peaches produced in this State have been grown there. Of course, the prospective peach-grower should select a position within reasonable distance of rail or water carriage, as the carting of this soft fruit long distances tends to bruise it and injure its market appearance, besides reducing the net profit.

Site.

A matter of almost as great importance as the soil is the choosing of a site for a peach orchard. By site is meant the exact situation of the orchard, whether in a valley, on a high-level place, or on a hillside. Generally speaking, a peach orchard must have good air and water drainage. A westerly aspect would be the most desirable, if protected from wind. During cold, frosty mornings the thawing process would be more gradual, and frosts would not be so likely to damage the blossom as in the case of orchards planted with an easterly aspect. In early spring, about blossoming time, a drop of one to three degrees in temperature about the trees may be very serious, and may cause failure of the crop.

Soil.

There are many kinds of soils in which peach-trees can be grown profitably. Generally speaking, however, the peach prefers light, warm, well-drained sandy or loamy land. Such a soil favours a firmer, better ripened and hardier growth, and produces fruit of the best colour and quality. Peaches will grow in heavy soil, provided the soil has good drainage and is kept mellow. In such strong soils the trees grow strong and live to a good age. For commercial peach-growing, however, the lighter, loamy soils are preferable.

The Preparation of the Ground.

The ground for peach-trees should be thoroughly prepared before planting. It is necessary to plough the land at least 8 or 9 inches deep. In most soils it will be found of benefit to follow the plough with a good subsoiler, breaking up the ground to at least 18 inches. By doing this the roots of the young trees will have a greater depth of moist, mellow soil, and the moisture-holding capacity of the soil will be increased. The object of the cultivator in the first preparation should be thorough tillage, and to bring the soil into a loose and friable condition. Thorough preparation is a great aid to future success, and a well-prepared, friable soil will increase deeper rooting, which is a most important thing.

Selecting the Trees.

In selecting peach-trees for planting, it should be borne in mind that it pays to have good ones, a poor tree being dear at any price. A good tree is one that has made a vigorous, stocky growth. The largest trees are not necessarily the best. They should be one year old from the bud, $\frac{5}{8}$ to $\frac{3}{4}$ of an inch in diameter, and about 4 to 5 feet high.

The preparation for planting consists in shortening back the side roots so that they will be about 6 inches in length. All bruised parts are cut away. The pruning of the top is done some little time after planting, and consists in heading off the tree to the desired height of about 15 inches.

Propagating Young Peach-trees.

The beginner will probably find it best to purchase young worked trees of the varieties required from a reliable nurseryman, but he should learn to replace failing trees and extend his orchard by propagating young trees himself.

It is usual to plant peach-stones in the fall of the year. These germinate in the following spring. The young plant should be given thorough cultivation and attention during the summer, and in the following autumn, buds of the required variety should be inserted about 4 inches above the ground. Next spring the tops are cut back to within 4 inches of the bud, and when the latter pushes forth, all suckers should be removed from the stock. Should more than one leader start from the bud, the healthiest should be selected and the others removed. When the young shoot is about 6 or 8 inches long, it should be tied to the portion of the stock remaining above the bud. As soon as the shoot has made a fairly sturdy growth, and is about 18 inches high, the portion of the old stock above the bud should be removed with the pruning shears. The young tree will then be ready for transplanting the following winter.

Laying out the Peach Orchard.

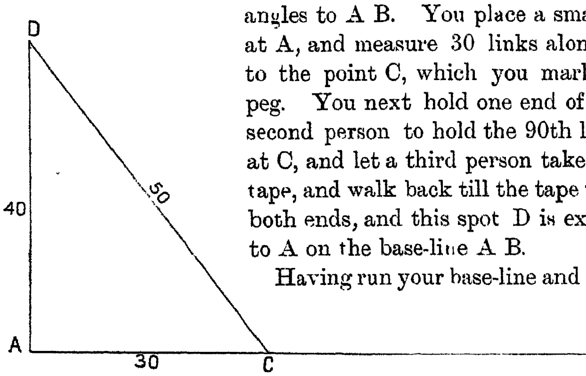
Before laying out the orchard, it is always a good plan to figure out how the trees can be arranged in planting to use the ground to the best advantage. The most widely adopted plan of laying out the orchard is the square system, although some planters favour the hexagonal. The advantage claimed for the square system is that it allows cultivation in either direction with the same ease. The following is the method employed in laying out on the square system :—

The land is laid off in straight lines parallel with each other, and at an equal distance apart, and these parallel lines are crossed by similar lines, also the same distance apart, but at right-angles to them. Where the lines intersect is the place to plant the tree. In planning out an orchard, the first thing is to provide yourself with a planting-wire, which can be of any length up to 500 feet that you wish, and is made as follows :—You take a length of No. 10 or No. 12 white wire, and fasten a strong ring of about 4 inches in diameter to one end of it. You then place this ring on a bar or stake that is driven firmly into the ground, and run out enough wire to give you the length you require. You then fasten a ring to the other end of the wire, which you strain tightly and keep strained by placing the second ring on a bar or stake, in a similar manner to the first ring.

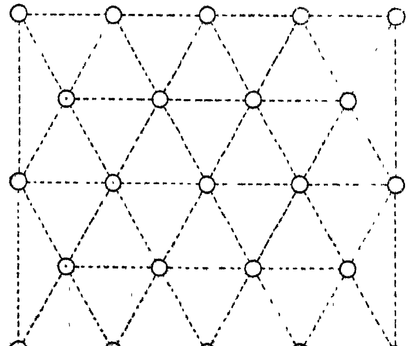
You now measure the strained wire carefully, and, at the distance apart you wish to plant your trees, make marks all along the line, taking care, of course, that the distance from each ring to the first mark on each end of the wire is the same as the distance between any two marks on the wire. To make the marks on the wire, bend a piece of No. 20 copper wire round the white wire and solder it in place. This gives a mark that is easily seen, and one that will not shift or wear out. Such a planting-wire will last for years with ordinary care, and if kept free from kinks is not likely to break. In planting out it will be found to be a great saving in time, and it will ensure accurate planting. The wire should always be stretched to about the same tension, or the trees at the lower end will be uneven. Rope can be used by stretching it very tightly and measuring the distance apart for the trees, with a pole of

the required length laid alongside of the rope and a peg inserted at the end of the pole each time it is moved, so as to show where the trees will stand.

In laying out the orchard, you select one of the longest sides as a base-line, and stretch your planting-wire along it, putting in stakes at each mark on the wire. At each end of your base-line you run a line exactly at right-angles to the base line, and extending the width of the ground to be planted. In planting a large orchard a theodolite is very handy for laying-off the right-angles correctly; but for a small orchard you can get your right-angles practically correct—if you use extreme care, quite correct—by the same means that a bricklayer uses to set his walls out straight and square. A triangle with sides in the proportion of 3, 4, and 5 will be right-angled; therefore, if you want to lay off a line at right-angles to any point on a base-line, you can do so by means of an ordinary tape measure, as shown in the following drawing:—A B is the base-line, and you wish to lay off a line at A, at right-angles to A B. You place a small peg in the ground at A, and measure 30 links along the base-line A B to the point C, which you mark with another small peg. You next hold one end of the tape at A, get a second person to hold the 90th link-mark on the tape at C, and let a third person take the 40th link on the tape, and walk back till the tape tightens equally from both ends, and this spot D is exactly at right-angles to A on the base-line A B.



Having run your base-line and two end lines at right-angles to it, you can complete the fourth side of your rectangle, making it as wide as your planting-wire is long. Stake the fourth side, and then stretch your planting-wire from the second stake on your base-line to the second stake on the fourth side. Stake and then shift to the third peg on each line, and so on till the other end is reached. If you have taken your right-angles correctly, and kept the wire strained equally tight all through, you will now find that the rows of stakes are in line in every direction, and the land is ready for planting the trees.



The second system is planting in hexagons, sometimes called the septuple or equilateral triangle method, and called erroneously quincunx, which is a totally different method. The hexagonal or equilateral system places every tree at an equal distance from all others, and more completely fills the ground than any other

method. It has also the advantage of presenting a greater surface to the wind than a square, the outer trees thus protecting the inner ones.

The accompanying drawing shows the method of planting in hexagons.

Do not plant your trees too close together, as they will rob each other of plant-food, and during dry years of moisture also. The latter consideration is an important one, which should not be lost sight of where irrigation cannot be practised.

Distance apart.—Peach trees are generally planted from 20 to 22 feet apart. The former distance gives 109 trees to the acre and the latter 90 trees to the acre by the square system. With the hexagonal, we get 125 trees to the acre when planted 20 feet apart, and 104 when planted 22 feet apart.

Cultivation.

In the drier districts of the State, the rainfall is not sufficient to give the best results with peach trees, unless man's industry aids the trees to obtain greater supplies of moisture than nature provides. This disadvantage is compensated by the great suitability of our warm, dry atmosphere to the production of fine, deliciously flavoured fruit. The latter consideration should induce us to devise and apply every means in our power to supply moisture, as this is practically the only respect in which our central-western lands fall short of being ideal peach country.

Irrigation is the time-honoured method of making good any deficiency in moisture. In this country, irrigation on a large scale is an expensive undertaking, requiring the creation of large storage reservoirs, such as that at Burrinjuck. In years to come we may hope to see such reservoirs in many parts of the State, and when that ideal condition of things is reached, it is safe to predict that the fame of New South Wales peaches will reach far beyond the limits of this Commonwealth.

In the meantime, growers or prospective growers should realise the great value of cultivation as a means of storing moisture in the soil. In this *Gazette* for January, 1911, Professor Watt gave an outline of the results obtained by experiment in other parts of the world, showing that, generally speaking, half the rainfall received can be stored in the lower layers of the soil by continuous cultivation. The Professor was speaking with special reference to the cultivation of wheat, but his remarks are just as applicable, and perhaps more so, to the cultivation of fruit in our drier districts.

It is unfortunately too common to see peach and other fruit-trees struggling amongst a mass of weeds. These come up in the spring, fed by the manure applied or the natural fertility of the soil; and they are drawing the moisture from the earth and transpiring it into the atmosphere through their leaves. Weeds rob your trees of plant food and moisture; cultivation destroys weeds and conserves moisture.

A story is told of the great drought year of 1902. In that year the rainfall received at our Wagga Experiment Farm was less than 12 inches, and as the summer was warm, the evaporation was very great. During that summer the cultivators had no rest in Wagga orchard, but were kept going all the

time to maintain a loose mulch of dry earth over the moist soil below. The result was that not only did the trees keep their condition but made a lot of new wood.

On one visiting day, a farmer was struck by the healthy condition of the fruit-trees at the Farm, and was informed that it was due to the continuous cultivation. "What!" said he, "you advise me to break up my orchard in this hot weather? Not me; the ground is dry enough without letting the water out like that! You fellows have got the Government behind you; that's why your trees are better than mine!"

This view of the question of cultivation is fortunately not a common one, but some growers are not yet convinced that the benefits resulting from continuous cultivation during spring and summer are sufficient to justify the labour. They are advised to try it on a small scale for one summer, in a corner of the orchard, and note results.

Where irrigation is practised, cultivation is equally necessary. In the warm districts, water will evaporate from the surface of the soil at an extraordinary rate; and even if it can be replaced without much trouble, without cultivation it merely induces a rank growth of weeds, which remove not only moisture but plant-food as well.

If our dry lands are to produce their due proportion of peaches, the cultivator in one form or other must play an important part in the work. There are several forms of cultivators—the disc, the spring-tooth, or the fixed tine—each having its merits under special conditions. Space will not permit of their being discussed here, but the fact must be emphasised that the man who attempts to grow peaches without a cultivator is not going to make as good a living from the industry as he otherwise would.

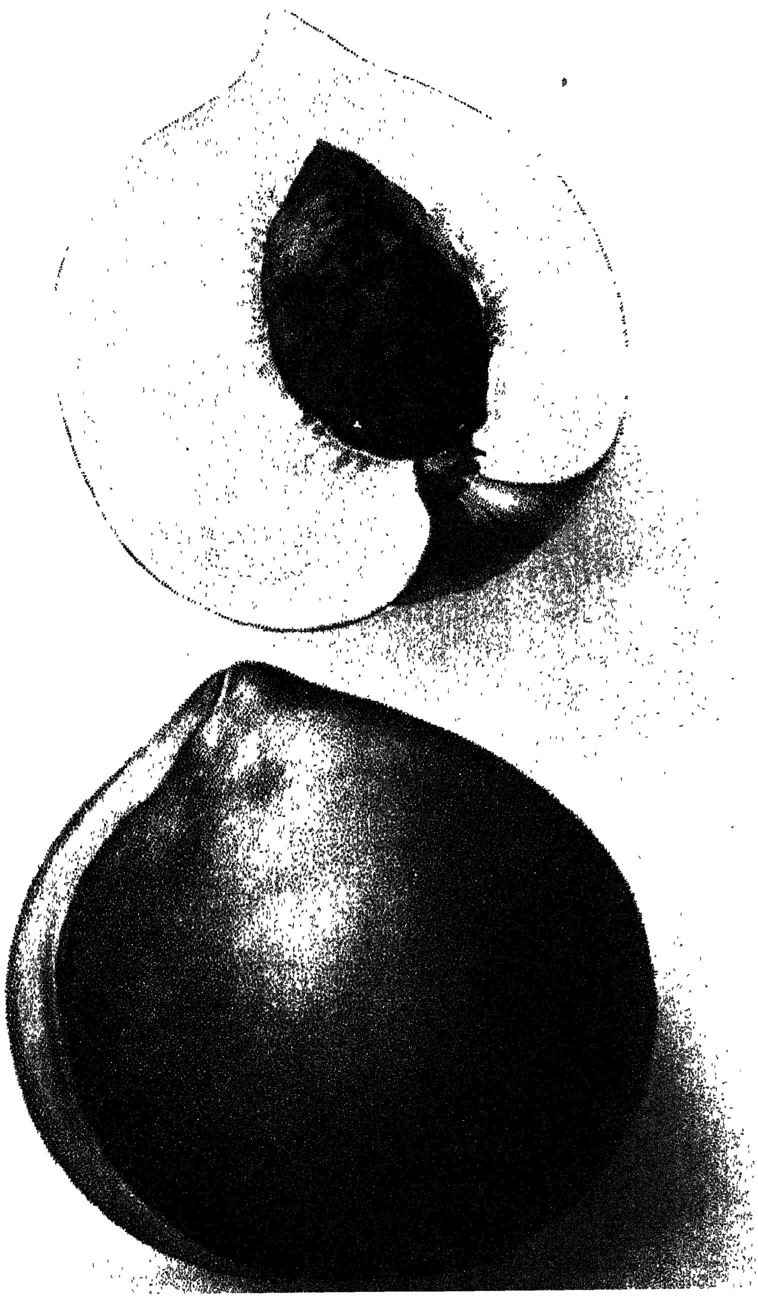
Pruning.

The peach-grower is advised to obtain a copy of my pamphlet on "Pruning," sold by the Government Printer, Sydney, for 1s. It would be impossible to give even an outline of this section of the work in an article such as this. It is one of the most important questions in all fruit-growing, and the novice is advised to make himself familiar with it as early as possible. In the booklet referred to the general principles of pruning are fully explained, and there is a special chapter, well illustrated, dealing with the peach and nectarine.

Nicholls' Orange Cling Peach.

In next issue some notes will be given on the most suitable varieties of peaches for particular purposes. The coloured plate now presented shows Nicholls' Orange Cling, one of the newer varieties of American origin, suitable for dessert or canning. The fruit is of large size, and quite round; the skin deep orange, with a red cheek in the sun; the flesh deep yellow, and firm. It is a fine clingstone peach. At the Hawkesbury Agricultural College it has proved a medium cropper, the fruit ripening 1st February.

(To be continued.)



Spraying for Codling Moth

AMENDED REGULATIONS UNDER FRUIT PESTS ACT.

THE attention of fruit-growers throughout the State is invited to the amended Regulations under the "Vine and Vegetation Diseases (Fruit Pests) Act, 1906," published in the *Government Gazette* of 8th November, 1911. Regulations 1 and 2 now read as follows: —

1. Every notice for the destruction of any fruit pest, plant, or package shall be in the form shown in Schedule 1A, and every notice for the treatment of any fruit pest, plant, or package shall be in the form shown in Schedule 1B. Direction as to the method or methods to be employed in order to effect such treatment or destruction shall be indicated on the back of such notice. The method to be adopted by the person upon whom such notice is served may be denoted on the back of the notice by reference to these regulations, and subject to such regulations the following methods of treatment or destruction shall be deemed to be effectual: —

TREATMENT.

(*a*) For codling moth (*Carpocapsa pomonella*): All apple, pear, and quince trees, and suckers, must each be bandaged effectively with a band of suitable material folded once and with the edge downwards. Each bandage must be nine inches in depth before folding, and must be so fastened as to be effective, and must be examined at least once in each period of eight days, and all larvæ and pupæ found therein destroyed.

Bandaging as above must be completed by the first day of October in each year in the following counties:—Rous, Richmond, Clarence, Fitzroy, Raleigh, Dudley, Macquarie, Gloucester, Durham, Brisbane, Hunter, Northumberland, Cumberland, eastern portion of Cook, Westmoreland, Camden. In other districts, unless otherwise indicated by an Inspector, bandaging must be completed by the first day of November. In both the above cases bandaging must be continued as long as fruit remains on the trees,

or

(*b*) All apple, pear, and quince trees, and suckers shall be sprayed effectively not less than three times with an approved brand of arsenate of lead, or such other substance or mixture as the Minister may direct in the *Government Gazette*, in the following manner, that is to say, the first spraying shall be completetd within five (5) days after the petals have fallen from the flower. The second spraying shall be completed within four (4) weeks after the petals have fallen from the flower. The third spraying shall be completed within nine (9) weeks after the petals have fallen from the flower.
Provided that if, in the opinion of an inspector, the spraying has not been effectively carried out, or if he deems another spraying necessary, the Minister may require the occupier or owner to apply a fourth application as aforesaid, or to bandage the said trees and suckers in accordance with the provisions of subsection (*a*).

(*c*) All apple, pear, and quince trees shall be kept clear of dead bark and broken limbs, and all cavities or crevices shall be cleaned out effectively. If, in the opinion of an inspector, any supports or other materials attached to or used in connection with any such trees are likely to convey any fruit pest, the inspector may require the owner or occupier to bandage properly or to remove or destroy such supports or other materials.

(*d*) Fruit cases or other packages in which infected fruit has been packed, or which are deemed likely to convey fruit pest, shall be treated by immersion in boiling water for two minutes.

DESTRUCTION.

(e) For codling moth—All infected fruit and also all fallen fruit must be collected and destroyed at least once in each period of two days.

(f) For any species of fruit fly (*Tephritidae*)—

(i) All infected fruit shall be picked from the plants and destroyed, and all fallen fruit collected and destroyed at least once in each period of twenty-four hours, except citrus fruit, which must be destroyed every three days.

(ii) All Seville oranges remaining in any orchard on and after the first day of September in each year, whether on the trees or otherwise, must be destroyed: Provided that at the request of the owner or occupier the Minister may exempt any crop, or portion of a crop, from the operation of this regulation for such period and subject to such conditions as he may think fit.

(g) The destruction of fruit must in each instance be effected by boiling for fifteen minutes, or by burning, or any other effective method approved by the Minister.

(h) The destruction of plants and packages must be effected by burning.

2. Fruit trees in any abandoned or deserted orchard, and which, in the opinion of an inspector, are likely to convey any fruit pest, shall, if so ordered by notice of the Minister under the Act, be destroyed by the owner or occupier.

SUPERPHOSPHATE FOR WHEAT.

THE figures compiled by the Government Statistician, showing the quantities of manures used in the State, do not separate superphosphate and bone-dust; consequently the exact quantities of superphosphate cannot be given. The Secretary for Railways has, however, kindly supplied the Department of Agriculture with the following return, showing the approximate quantities of superphosphate consigned by rail from Sydney, and received over the Victorian border from Melbourne during 1910:—

	tons.
From Darling Harbour	17,900
„ Alexandria	500
„ Newcastle	1,380
„ Victoria—received at Albury	4,553
„ „ „ Corowa...	1,296
Total	25,629

In 1909, the total quantity of artificial fertilisers used (superphosphate, bone-dust, &c.) was 21,659 tons. Figures for 1910 are not yet available; but this shows that superphosphate is the only artificial manure used in New South Wales in any considerable quantity.

Compare these figures with those of South Australia, where 76,500 tons of superphosphate were used last year. In that State, also, more than half of the total area cropped is fallowed land. The delegates from this State to the Adelaide Dry-Farming Conference in March last were impressed by the large number of South Australian wheat-growers who have retired in middle life, and the large number of privately-owned motor cars to be seen at country shows.

The Vine in Australia.

[Continued from page 637.]

M. BLUNNO, Viticultural Expert.

DURING my travels throughout the State, I have come across several people who grow table-grapes, but cannot be induced to plant a vineyard with wine grape kinds, because of conscientious objection to wine-drinking. Many others, without such objection, prefer to grow table-grapes, for being situated close to the Metropolis, or to some big country town, they find a ready market for their crop at a most profitable price; and I know of several such vineyards in the neighbourhood of such towns that are a real gold-mine to the owner. When the markets are glutted the surplus grapes are turned into wine, and although the table grapes generally produced in Australia, with the exception of the Chasselas and the Doradillo, do not make wines with any typical character, still if the grower could refrain from adding so much sugar to the juice prior to fermentation, or from fortifying it with spirit after fermentation, a wholesome, light, pleasant, alcoholic beverage could be made out of surplus eating-grapes. It would be a better drink than beer or whiskey, and might be consumed by the labourers when engaged in hard toil, especially during summer months. The same grapes could be crushed, the liquid expressed, put in a cauldron, brought to a simmer, and then bottled. Thus the grape-juice would not lose much of the characteristics of fresh grape-juice, and diluted with plain or syphon water, or mixed with milk, would make another kind of wholesome beverage, such as I had opportunity of sampling recently at a table-grape grower's house. A regular trade might be established with this unfermented grape-juice if prepared, not in the rough-and-ready way above described, which would only be a manner of preparation for home use, but suitably filtered, or fined and pasteurised, as I shall explain in the course of these articles.

Amongst agricultural pursuits, viticulture is one of those that require a good deal of manual labour; hence vine-growing districts have a large relative population, and viticulture is one of the rural industries best indicated for close settlement. Furthermore, there is hardly any plant so indifferent to the kind of soil, limiting all its demands to one, that the ground be not too wet, and that its roots shall never live in stagnant moisture. For the rest, from a volcanic soil on the side of a hill, to an alluvial plain, or to a sand-dune, the grape-vine will adapt itself.

In spite of all this, we see vine-growing in Australia creeping but slowly along, for the reasons already explained. It is strange how certain prejudices get deeply rooted on a mere coincidence of words, or on a solitary case of trouble, true or imagined, and how such prejudices may affect the development of an industry.

Australians, like their forbears, are great meat-eaters, still regard fruit as a luxury, and have no idea of the amount of fruit eaten in that part of Europe with a climate that is somewhat similar to that of the temperate zone of this continent. There, even the children of the poor break their fast with bread and cherries, or apricots, figs, grapes, oranges, &c., and when the fruit of the mulberry-tree and of the prickly-pear (*Cactus opuntia*) are ripe it is a feast for all. It is by eating so much fruit that poor people in those countries take the ration of sugar necessary to the daily diet. I never heard medical men say that by eating grapes there is a risk of getting appendicitis, and grapes there are generally eaten skins, seeds, and all. In Australia, again, people will not touch wine-grapes. Certainly the varieties which are classed as eating-grapes are more palatable, but the wine-grape as a fruit is just as wholesome; more so, in fact, because it is more juicy, contains more grape-sugar, and a larger proportion of fruit acids.

Who has not heard of the wine-stone, and how many people are there who, if not afraid of rheumatism, dread wine on account of the wine-stone? Wine-stone with them suggests gall-stones and stones in the bladder, because they do not know what wine-stone is. Wine-stone is nothing but cream of tartar or potassium bitartrate, of which every person takes a lot in the shape of baking powder, so much used in preparing unleavened bread or scones. Those who do not drink wine on account of wine-stone, have no objection to eating grapes; yet by eating 1 lb. of grapes, the amount of the so-called wine-stone taken is equal to that contained in a tumblerful of unfermented wine, and twice that contained in a tumblerful of wine. The potassium bitartrate in the grapes, or in the wine, is in solution, and even if it were in crystals, it would make no difference. Everybody knows that potassium bitartrate is a mild laxative and diuretic, and therefore a solvent that will help to prevent rather than cause obstructions.

I thought it necessary to make reference to the above, because I have heard many a time of dread now of this, now of that, in connection with wine drinking or grape eating, and it is certain that viticulture will never really progress till people at large show a greater inclination to consume what their land can produce, besides its meat and beer. A larger consumption of light wines, more fruit eating, good olive oil more freely used as a condiment, and Australians, so rightly proud of their continent, can then claim to be the true children of their country.

Climate for the Vine.

The quality of the grape crop, specially with the view to wine-making, is dependent on several concurring factors, viz., climate, soil, kind of vine grown, method of pruning and training, system of vinification, and of keeping the wine.

There are four phases in the vegetation of the vine:—(1) when in shoots; (2) when the shoots blossom; (3) when the fruit ripens; (4) when the vine rests in winter. A minimum temperature in the air is indispensable for the vine to go through each of these stages, and if that minimum is not reached the vine as an economic plant cannot be successfully grown.

Vines generally will shoot when the temperature during daytime will rise up to 50 degrees or 52 degrees F.; will blossom when with the season advancing it will rise to 62–64 degrees F.; and to carry the fruit through the process of ripening a minimum mean temperature of 77 degrees F. during the daytime is required. In winter-time the mean day temperature should be below 50 degrees F. that the vine may rest, otherwise it will go on shooting. It is so in subtropical countries, where grape-vines throw fresh young shoots all the year round, as all the year round are to be found new blossoms and grapes in various stages of ripeness, and on the same bunch berries in various stages of maturation are to be seen. The fruit is watery and inferior. The system of checking and regularising the continuous growth by pruning the vine every other year gave no success.

Vines during their resting period in winter can stand very low temperature; the *Vitis vinifera*—that is the European vine—will bear as much as 64 degrees of frost, viz., 32 degrees below zero. The American vines, among which the phylloxera-resistant stocks are found, will stand even from 86 degrees to 124 degrees of frost, viz., from 54 degrees to 92 degrees F. below zero. Temperatures below those indicated will freeze the ground to a great depth, and kill the vines, roots and all.

The time that elapses from when they shoot till when their grapes are ripe is from 150 to 180 days. That time is called the vegetative period, and is longer or shorter according to the climate—longer in colder climates, shorter in warmer countries. During its vegetative period a vine must absorb a certain quantity of heat spread over its various stages, the total amount varying from 2,500 to 4,000 calories, according to the kind of grapes, each having its own requirements. Some kinds of vines shoot early and ripen late, others shoot late and ripen late, but not all early grapes shoot early, as not all late grapes shoot late Some early varieties, like the Cabernet, shoot late and ripen early, while some late kinds shoot early and ripen late, which means that the minimum temperature required by some varieties to initiate their vegetative period, and then to come in flower, and the heat required during the phase intervening between blossoming and ripening of the grapes, vary from kind to kind. In a word, the number of calories required by every individual sort of vine varies from sort to sort during each stage of the vegetative period. Some require more of these than others when they are to sprout; *vice versâ*, those that require a less number of calories to go through that phase, may require more calories in order to blossom, or after blossoming in order to go through the process of maturation of their grapes.

When tapping a new district where the climate is colder, it is essential to consider the varieties to be introduced and their requirements, for if in that district the spring is long and the summer short, a variety indigenous to a country with a hotter and longer summer should not be introduced, lest the vine fail to gather the necessary number of calories from the time the fruit sets till that when the crop should be ripe. Kinds that are early in their country of origin should be preferred when introducing them in a colder climate, because under such climate they would still be early, such being

their character, and by having a longer vegetative period they stand a better chance of gathering the sum total of heat required to carry the crop to the complete ripening stage. Early shooting varieties introduced in a relatively hot country will allow of planting on the hills, where the climate is colder, and will still mature their crop, owing to their longer vegetative period. Of course, the vineyard should then have an aspect and location where it can escape spring frosts. Varieties ripening early should be preferred, or at least such varieties as better stand protracted wet weather, should be chosen where the commencement of autumn is usually rainy.

By scanning the minimum temperature necessary to the vine through its vegetative period, my reader, who might be one of those who consider the vine a plant requiring a rather hot climate, will disabuse his mind, as some of the best wines in the world are made in countries where the temperatures hardly ever go any higher. There the vegetative period is longer, to enable the wine to absorb the required amount of heat; so, the process of ripening is gradual, and in those mysterious crucibles—the leaves and berries—the chemical constituents of the future wines are elaborated, those ingredients that will in time give the fine, delicate bouquet for which they are famous.

The introduction of a variety indigenous to a cold district into a relatively hot country does generally shorten that vegetative period, for the plant can absorb its number of calories in a shorter number of days. Such vines generally contain a higher percentage of grape-sugar, although some kinds, like the Rhine Rieslings, introduced in the south of Europe, do not give sweeter grapes than in their country of origin. In general it is advisable never to introduce a variety from a warmer country into a colder one, although, as above stated, it may be done if that variety is an early kind. The safest course is to introduce into a hot country a kind that is indigenous to a country similarly hot, and into a colder one a kind originally from one similarly cold; but it is safe to import a variety indigenous to a cold climate into a warm one.

In Europe the vegetative period of the vine may extend over as many as 200 days, that is, in a colder climate, or one less favoured by sunny days, or on the hills, or at the feet of mountains in Southern Europe; the average duration, however, is about 180 days. In the three principal vine districts of New South Wales, viz., the County of Cumberland, the Hunter River, and Riverina, it lasts about 150 days.

The wines of the old world are well known, and have established their reputation; they are produced under special climatic circumstances, in certain soils, with certain grapes. More or less similar soils and climatic conditions can be found elsewhere, especially in the large continents, and the person setting about planting a vineyard for the purpose of wine-making, if he aims high, should first try and place himself in conditions of climate and soil as similar as possible to those of the districts or locality where the kinds he intends to grow have best asserted their renown. In this State, like elsewhere in Australia, lighter wines of new types might be produced that would perhaps

satisfy even those who decry every local wine, if colder districts were tapped, whilst the elevation of a few hundred feet would correct the latitude of certain others, often unfavourable for the production of lighter wines, bearing in mind the ancient motto, *Bacchus amat colles*,—"Bacchus loves the hills."

In rich soils, in a fairly hot district with a rainfall of from 20 to 24 inches, the grape-vine is eminently suited for sweet wines, and for wines of port and sherry types; also for strong wines for the purpose of blending, and for the production of luscious table-grapes, which, under such climatic conditions, develop a remarkable flavour or aroma, while the pulp and skin are firmer, thus being more easily carried over to distant markets. Such districts are also most suitable for the production of sultanas, currants, and raisins.

Wines produced in a hot climate where the rainfall ranges from 20 to 40 inches are lighter in alcohol and body than the others, but still deficient, if not to the same extent, in grape-acids, a higher proportion of which is essential to give the wine sapidity, freshness, and vim, and make it susceptible of developing with age those particular ethers that form the bouquet.

Two wines, in order to blend well, should be at the opposite poles with regard to at least the two principal ingredients, viz., alcohol and grape-acids; that is to say, one wine should be rich in alcohol and deficient in acids, the other deficient in alcohol and rich in acids. No wine in this State, by being blended with a wine from another district, would turn out a wine of a new type altogether that would be far superior to either. The reason is that the wines in New South Wales have a similar characteristic all through, which is impressed upon them by the hot summers, that is, a deficiency in grape acids more or less conspicuous but ever present. It is for this reason that I always advocated the addition of tartaric or citric acid to the grape-juice when the juice is vatted for fermentation.

Notions that have their foundation of reason in the leading vine-growing districts of Continental Europe were, and are, often acted upon in new countries by the pioneers, and such notions are still held in honour as axioms, though in this, like in several other cases, we should say with the scholastics, "I distinguish." The hillsides of the viticultural countries of Continental Europe are in many places utilised for vine-growing. The aspect of the vineyard there is of great importance, and a south or south-eastern slope is always preferred, for the vines there catch more sunlight and heat; but, then, those countries have a colder latitude, and the sites have an elevation at which in Australia there are yet no vineyards. Here instead, where sunlight and heat are not wanting, a north or north-easterly aspect is not essential. Northerly and north-westerly winds in this State blow strongly and frequently, and they are hot in summer, and that is another consideration that goes to alter the question of the aspect of a vineyard, making it advisable where such winds prevail, to plant the vineyard on a slope looking south or south-east.

In Continental Europe, the vine-grower wants a fine warm summer to make sure that his crop will ripen well, which is not always certain. It is a fairly general experience that where vines mature their grapes gradually—where the period from the time the berries begin to turn colour till the ripening, is longest—these grapes give wines with fine flavour. A precipitate ripening, full and complete as it may be, is detrimental to the quality of the wine as far as the bouquet is concerned; that is, age does not bring forth those wine ethers of which every grape, grown under the conditions most suitable to it, is capable. In the case of a precipitate ripening the flavour may be strong, but seldom is delicate; but where maturity evolves gradually and extends well into the first month of autumn—which means that in that country the summer is not too hot—there one finds wines developing with age a fine delicate bouquet. It is understood that I am referring to light table wines, because in the cases of Muscat and sweet wines of sherry and port wine types, not only do the above considerations not apply, but the climatic conditions objected to in the case of light wines are all important in that of the latter named wines, which are characteristic for their strong aroma or flavour, the intensity of which is in direct ratio to the amount of heat and sunshine which the grapes enjoyed. Often the writer has heard people from the colder districts of the State say that wines could not be made because grapes do not ripen; but ripeness of grapes for wine-making is a question of degree, and a question of the sort of wine that it is intended to make. A wine-grape may contain 24 per cent. of sugar and be sour, a table-grape may contain only 18 and be sweet; sourness being given by the grape-acid, the proportion of which is usually much higher in the former.

Summing up, the climate with respect to the vine may be hot, temperate, or cold. In a hot climate, even if relatively dry, vines are healthy and vigorous; they produce a good crop without much need of fertilisers, and the grapes are very sweet but deficient in grape-acid. The type of wines that can be produced under these conditions are the *vins de luxe*, such as sherry, port, Madeira, Marsala, and *vins de liqueurs*, such as Muscats and other sweet wines, and wines suitable for blending with others less alcoholic and more acid. In hot climates the fermentation of grape-juice takes place under difficulties on account of the grapes arriving at the mill very hot, so that the high initial temperature of the juice, together with its high specific gravity and the deficiency in grape-acids, go to form a set of unfavourable conditions for a complete fermentation. Often not all the sugar contained in the must transforms itself into alcohol, and the activity of the yeast is marred by the quick development of other germs, which act on the various ingredients of the must and cause the formation of other substances that taint the wine and spoil its palatable characters.

In the temperate zone the vines grow vigorously but require more manuring; grapes ripen well, although it takes the vine longer to carry the crop to maturity; and *vins ordinaire*, or high-class table wines, are produced. Such wines contain less alcohol and more grape-acids than the wines of hot districts. In the continent of Europe, where wine is a common

beverage, *vins ordinaires* form the bulk of the production, but the zone comprises some of the districts most reputed for their fine table wines, viz., Bordeaux, Burgundy, Champagne in France; Rhine and Moselle in Germany; Tokay in Hungary; Barolo and Asti (Piedmont) and Sassella (Valtellina) in the north of Italy; Chianti (Tuscany) in the centre; and Lachrima Christi (Naples) on the hills of the south of the peninsula. In the temperate zone the ripening of the grapes is gradual and normal, and fermentation of the juice proceeds regularly.

In cold climates, whether they be cold on account of the latitude or on account of the elevation, grapes do not mature too well except on specially selected sites, sheltered from cold winds, and with the sunniest aspects; grapes grown in such climates are deficient in sugar and contain too much of the grape-acids; fermentation is also initiated and carried through with difficulty on account of the too low temperature. Here the grape-juice often must be warmed to start fermentation. Wines of cold climates blend well with those of hot countries, and the blend greatly improves both. It is to make wines under climatic or other disadvantages that the need of the œnologist is most felt, and the above references in this chapter go to show that a vine-grower may be a poor hand at wine-making, but the wine-maker must be a viticulturist.

(*To be continued.*)

The Colour of Soils.

Messrs. W. O. Robinson and W. J. McCaughey, of the Bureau of Soils, United States Department of Agriculture, have prepared Bulletin No. 97 of that Bureau, "The Colour of Soils." The authors state that all soils are made up of varying amounts of materials having the three fundamental soil colours—white, black, and red. Greyish colours they consider to be composed of mixtures of black and white; yellowish, mixtures of white and red; brownish, mixtures of red and black.

Whitish or grey soils are not generally of much agricultural value. They usually lack organic matter and iron, and have a high content of silica and alumina. But light-coloured clayey soils are generally fairly rich in potash.

Yellow soils owe their colour to small amounts of ferric oxide, more or less hydrated.

Black soils are rich in organic matter, and frequently in lime. The colour is thought to be due to black humus bodies being formed from decaying organic matter and lime. Black soils are universally esteemed highly. Of course mechanical condition must also be considered.

Red soils owe their colour to ferric oxide. The colour indicates good drainage, as stagnant water would dissolve away the colouring ferric oxide. Red soils are generally older, in a geological sense, than yellow ones, and the drainage is better.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

INDIAN CANE.—" R. H." (Inverell) : Indian cane is not suitable for the Inverell district. It succeeds only in tropical or semi-tropical districts. It has been a great success as a fodder crop on our Northern rivers, but does little or no good south of the Manning. For a district like Inverell, maize and sorghum, which belong to the same family, are far preferable.—GEO. VALDER.

PURIFYING MUDDY WATER.—" W.D." and " C.E.I." : To purify muddy water dissolve chloride of iron (ferric chloride) in a little water, and add it to the water in the tank, stirring well for a few minutes. The water will become clear in from twelve to twenty-four hours. Use from ½ lb. to ⅝ lb. of chloride of iron to 600 gallons of water, or, say, 1 lb. to 1,000 gallons.—F. B. GUTHRIE.

EGG-PULPING.—" S.T.S." : Egg-pulping is carried out in countries where eggs are cheap, a saving being effected in freight. The shells are broken, and the contents poured into a tin, or the yolks may be put into one tin, and the whites into another. This method is not generally adopted in New South Wales, because the egg market in this State is the best in Australia, but is only used by pastrycooks and large dealers, who place the pulp in cold storage, and take it out as required.—GEO. BRADSHAW.

MAIZE SILAGE.—" L.J.O.S." (Byron Bay) : A silo, 25 feet high, 16 feet in diameter, would hold 100 tons, which would be sufficient to feed forty cows for four months. Maize is one of the best crops to grow for making into silage, but drilled corn is, as a rule, superior to broadcast. If a small quantity of lucerne, cowpea, or other leguminous crop of this kind can be mixed with the maize, it will increase the feeding value of the silage, as well as render it easier to make. As a rule, maize silage takes two or three months before fermentation is completed, and it can then be fed to cattle. The average yield of maize fodder in your district would be about 10 tons per acre.—GEO. VALDER.

INJURED HORSE'S HOOF.—" G.G." : From your description it is evident that your horse is suffering from quittar, probably due to severe bruising or staking. There may be a piece of wood or other foreign matter in the hoof, or else there is a piece of dead tissue, and, so long as that is present, the wound will continue to break out and discharge. The next time the wound is about to break you should cast the horse, open the swelling widely with a clean knife, examine carefully to see whether any foreign body is present, and swab the wound out with strong iodine solution. Dress the wound daily with iodine for some days, and let it heal up slowly. If this should prove unsuccessful, an operation will probably be necessary, for which the services of a qualified veterinarian should be obtained.—MAX HENRY, M.R.C.V.S.

CONTENTS OF HAY SHED.—" J.R.H." : A shed 30 feet long, 12 feet wide, and 8 feet high, would contain 2,880 cubic feet. The weight of the hay would vary, but, approximately, it takes 500 cubic feet to the ton. The weight of your hay would, therefore, be about 5½ tons.—GEO. VALDER.

LIME FOR STOCK.—" L.R.E." : Yes, lime is good in the lick for stock. A suitable mixture is—salt, 5 parts ; lime, 1 part ; sulphur, 1 part ; and sulphate of iron, ½ part.—T. G. PALGRAVE, M.R.C.V.S.

MURRUMBIDGEE IRRIGATION SETTLEMENT.—" W.T.H." : You should apply for information concerning these lands to the Executive Officer, Murrumbidgee Irrigation Trust, Department of Public Works, Sydney.

An article on soldering and brazing appeared in July, 1911, *Gazette* ; page 619.

Indian Cane and " Cow Cane " are the same plant.

MANURIAL VALUE OF THE BLACK THISTLE.—"G.H.D." (Tamworth): The black thistle, when ploughed in, would have no special value in accumulating nitrogen, and its incorporation with the soil would have exactly the same effect as that of any other non-legume in providing humus, improving the texture, increasing water-holding capacity, and preventing undue evaporation.—F. B. GUTHRIE.

"CURLY BLIGHT" (LEAF CURL) IN PEACHES AND NECTARINES.—"W.F.B.": The trees should receive a spraying with lime-sulphur solution when the buds are swelling in the spring, followed by an application of Bordeaux mixture after the fruit has set. If moist conditions prevail shortly afterwards, it will be necessary to make a further application. Leaflets showing formulæ have been posted to you.—W. J. ALLEN.

PADDY'S LUCERNE (*Sida retusa.*)—"D.K.O." and "R.B.": This is a most difficult weed to eradicate. It can be prevented from seeding by cutting, but, as it shoots from the crown, this will not kill it. In fact it is almost impossible to destroy it in a grazing paddock without digging it up. I would certainly advise that, if possible, the land should be ploughed up and cultivated, and afterwards laid down again with grasses. Small patches of this weed can be destroyed by spraying with arsenite of soda, made up of 1 lb. of the chemical to 10 gallons of water. This solution will, however, kill the grass as well as the weed; but the poison quickly disappears, and the land can be again sown with grasses after the first heavy rains. Care should be taken to see that stock are not allowed to graze where the poison has been sprayed.—GEO. VALDER.

SPRAYING ORANGE AND MANDARIN TREES.—"F.E.B." (Gosford): For Red Scale, Brown Bug, and Wax Scale, the most effective remedy is fumigation, which should be done at the end of February or early in March, at night time. If the trees are badly infested, spray at once with resin wash on a cool day. Borers should be hand-picked, and the trees sprayed with arsenate of lead. For eradication of aphis, spray with tobacco wash. Leaflets, giving formulæ for sprays, have been posted.—W. J. ALLEN.

PEAR-TREE NOT SETTING FRUIT.—"H.W.G.": The non-setting of the fruit on your pear-tree may be due to either a droughty condition of the soil, or an excess of moisture at blossoming time. Some varieties of pears are naturally shy bearers—the flowers being self-sterile. In that case it is necessary to plant a pear of a different variety blossoming at the same time, so that a proper fertilisation takes place. I think the last-named condition must be the reason of the fruit not setting on your tree.—W. J. ALLEN.

GRAFTING GRAPE VINES.—"A.E.L.": It is not easy to get a graft to take when it is inserted above the ground. It is more than likely that yours will not shoot, although there is time yet. Grafts should not be put in until the buds on the vine are about ready to burst, when it is found they usually take readily.—W. J. ALLEN.

MIXING SPRAYS.—"R.W.H.": Arsenite of soda and Bordeaux mixture can be used in conjunction as one spray, but it has been found that it is apt to russet the fruit and burn the leaves. Arsenate of lead and Bordeaux mixture is considered by many fruit-growers to be the safer combination to use; but, if rain falls shortly after an application is made, this mixture has been found at times to slightly damage fruit and foliage.—W. J. ALLEN.

Orchard Notes.

W. J. ALLEN.

December.

Pests.

Keep a strict look-out for pests, and if trees have not been fumigated or sprayed, as the case may be, the grower should lose no time beginning to fight them. For scales on citrus trees, December, January, February, and March are good months for either spraying or fumigating; but for fungus diseases it is generally best to spray once before the tree blooms and again as soon as the fruit has set, rather than leaving it until now. In many cases, however, later sprayings are both beneficial and necessary. The grower should not neglect to either fumigate or spray all citrus trees so as to ensure clean fruit and healthy trees, but do not treat trees that are weak and out of condition, else they may be damaged.

Complaints have been made by a few orchardists of the burning of the foliage with arsenate of lead. As there are several brands on the market it would be well for orchardists to apply the spray to a section of a tree of the different varieties in the orchard, as by making such tests one is enabled to ascertain if the mixture is too strong, and if so, the quantity of arsenate of lead may be reduced, so that no scorching or damage to either leaves or fruit will occur. Some varieties are more tender than others, and by carrying out experiments as described above the grower will know how to reduce the strength of the arsenate of lead when spraying such varieties. The first spraying, to be given just as the petals are falling, should be the strongest application, while for subsequent sprayings the quantity of arsenate of lead may be reduced to 1½ lb. to 50 gallons of water, and it may be found that for some brands of arsenate of lead 2 lb. to 50 gallons of water will be quite strong enough for the first application.

By testing the spray on a few trees before proceeding to treat the orchard, the possibility of damaging foliage or fruit may be avoided.

Codling Moth.

Keep a strict watch over bandages on the apple, pear, and quince trees, and see that all fruit is picked up and destroyed, either by feeding it to stock immediately or boiling or burning it, but not by burying it, as a few of our careless growers have tried to do. It is to the interest of every grower to see that every grub is destroyed before it can fly. The man who buries his fruit is only breeding moths for himself and his neighbours, and, therefore, in the interests of the fruit industry, it is hoped that any growers who may be found resorting to this means of disposing of their fruit will be reported to the Inspectors and made an example of. We hope that growers will assist the Inspectors in every way possible, and that where they know of those who are trying to evade the Act they will report them.

The regulations under the Fruit Pests Act have been amended in so far as allowing growers the option to either bandage or spray. The spraying must be done with an approved brand of arsenate of lead. Particulars of the amended regulations are given elsewhere.

Fruit Fly.

As soon as this pest makes its appearance, set kerosene traps around the trees or hang them in the trees. These traps are tins about 5 or 6 inches square and 2 inches deep, with a half-inch of kerosene on the bottom. Pick up and boil or burn all fallen and infested fruit every day.

Pumpkin Beetle.

The Orchardist at Hawkesbury Agricultural College reports as follows:—To every pound of slaked lime add one-quarter ounce of Paris green. The handiest way to apply it is to make a bag of double cheese-cloth, put the mixture in the bag and shake gently over the plants. One man can go over several acres in a day. I find it much more convenient than spraying. The operation must be repeated every time wind blows the lime off or it is washed off by rain. Apply early in the morning, as it sticks better when the plants are damp. Some growers have given occasional sprayings with Swift's arsenate of lead, which they claim has given good results.

Exporting Apples.

It is time to make arrangements for space in boats if fruit is to be sent to Europe this coming fall. It would be well for those who have a good crop to arrange to send a trial shipment, be it ever so small, either in conjunction with some person or company who is exporting, or, better still, through the medium of the Fruit-growers' Union.

Irrigation.

Where irrigation is practised it will be found necessary in most cases to give the soil a good soaking this month. Where young trees or vines are being watered, see that the soil is well soaked around their roots, and as soon as the ground is dry enough after the watering, cultivate the land thoroughly, and work around the trees and vines with a fork hoe.

Fruit-curing.

Apricots will be the principal fruit for curing this month. See that the fruit is perfectly ripe before picking; then cut them evenly, fumigate, and put them out in the sun with as little delay as possible. Do not cure them too much, but take them in whilst yet quite pliable—after most of the moisture has left them. Pamphlets on curing fruit may be had on application to the Department of Agriculture. These will give all details in connection with this important work.

Cultivation.

All orchard land should be kept free from weeds, and to this end the horses and cultivators should have but little rest this month, as an orchard

neglected for a few days will soon be covered with a coating of summer grass which will take many a hard day's work to eradicate, and couch grass spreads rapidly when left undisturbed. Where there are bad patches of couch grass, they should be ploughed up and harrowed on a very hot day, as the roots soon die when exposed to the sun.

Passion Vines

which have been properly pruned and manured during November, will now be putting on good growth and blooming freely. This fruit will be ready to meet the demand at Easter, when it usually finds a ready sale at good prices.

Pineapples.

In tropical districts pineapples may be planted if moist weather prevails. Suckers are the best to plant, being much the strongest and earliest to arrive at maturity. Being great feeders, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young, cultivation must be thorough, but not deep enough to cut the feeding roots, which are near the surface.

Bananas and other tropical fruit may be planted during the rainy season.

Thinning Fruit.

In nearly every orchard are found trees which are apt to overbear, or which carry heavy crops every alternate year, while during the off year they set very little fruit. During the plentiful year the tree is so weakened that it requires a year's rest before it is in condition for carrying a crop. How much better would it be, therefore, if we would use every means to regulate the cropping; that is, to try to help the tree carry yearly crops of good fruit, in place of heavy crops of indifferent fruit every other year and very little during the off year.

In order to obtain the fruit which is most sought after by exporters as well as for the local trade, we must have medium to large fruit, of good colour and flavour, and this we seldom get from a tree which is allowed to overbear, so that it is best to resort to heavy pruning during the winter previous to the summer when a heavy crop is anticipated. If it is found that the tree still sets more fruit than it can properly mature, it is best to remove a fair proportion from the tree. In some cases as much as half of the fruit requires to be taken off. This thinning should take place as soon as possible after the pits harden in stone fruits, while apples may be thinned towards the latter part of November in the cooler districts, and a little earlier in the warmer districts. Picking off and destroying moth-infested apples and pears should always be practised.

Loquats require thinning soon after they are well set if the largest fruit is to be expected.

Seedling Oranges.

I have to acknowledge receiving some very fine samples of Paterson River Seedling Oranges, grown by Mr. F. Vogele. The fruit was of good size and colour, and the flavour excellent.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Bathurst	Mr. S. McKibbin, O'Connell.
Bonville	Mr. H. B. Faviell, Bonville.
Cardiff	Mr. D. Straker, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Casino	Mr. D. J. McAuliffe, Casino.
Coreen-Burraja	Mr. H. Vickers, Coreen.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gunning	Mr. E. H. Turner, Gunning.
Hoxton Park	Mr. E. Banks, Hoxton Park.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. T. Glasgow, Kellyville.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Lawrence	Mr. E. T. Cooney, Lawrence.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, Penrose.
St. Mary's	Mr. W. Morris, Queen and Victoria sts., St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. T. Collins, jun., Tallawang.
Trundle	Mr. J. A. Porter, Trundle.
Wagga	Mr. G. H. Kelsey, "Coolroy," Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. S. Mann, Good Hope, Yass.

OBJECTS.

The objects of the Bureau are to gather information respecting plants, animals, or products likely to prove of value to cultivators; to discover the best methods of cultivating suitable economic crops, of breeding and feeding domestic animals, and of preparing products for market; to settle for each district the best times for fallowing, sowing, and harvesting; to prevent introduction and spread of insect and fungous pests; to encourage social intercourse between farmers' families; and generally to raise the social and educational status of the men now on the land and of their families.

The Government will subsidise the branches at the rate of 10s. for every £ received in membership fees. An annual subscription not exceeding 5s. a member should be sufficient for all requirements. Regular monthly meetings should be held, and arrangements made for papers to be read at the meetings by members on various points of local or general interest in connection with agriculture, and these papers should be fully discussed. Whenever possible, an expert from the Department of Agriculture will attend the meetings, and give an address and demonstration on any matter of interest to the members.

General Notes.

This month we record the formation of five new branches, at Cardiff, Coreen-Burraja, Dunedoo, Gunning, and Penrose, making a total of 36. The movement appears to be commending itself to the farmers of the country.

Many of the branches notified that meetings are now to be discontinued till after the harvest. It is hoped, however, that an endeavour will be made to comply with the request made in last month's *Gazette*, and set apart an early meeting for the purpose of discussing the subject of "Co-operation." Should this matter have escaped the notice of some of the members, attention is drawn to the announcement in the November *Gazette*.

One of the objects of the Bureau to which the branches have not so far given much attention is the encouragement of social intercourse. One branch some time ago arranged a dance after a lecture, which was the cause of much enjoyment. The Department trusts that Honorary Secretaries will not entirely neglect this not unimportant function of the Bureau.

Cardiff.

A branch has been formed at Cardiff, consisting of seventeen members (for the present). The annual subscription has been fixed at 2s. 6d., and a regular meeting will be held in the School of Arts every fourth Saturday evening at 7 p m. The following office-bearers have been elected:—Chairman, Mr. Thomas Peattie; Vice-Chairman, Mr. George Warren; Honorary Treasurer, Mr. Robert Gibson; Honorary Secretary, Mr. Donald Straker, Cardiff.

Carlingford.

The Government Entomologist, Mr. W. W. Froggatt, gave an interesting lecture to members in the local public school, on the 28th October, there being about forty present. The subject was "Insect Pests," and Mr. Froggatt dealt with the insect pests infesting the orchards of the district. A lantern was used to illustrate them.

Coreen-Burraja.

A branch of the Bureau has been formed under the above title. Fifty members have joined, and the membership fee has been fixed at 5s. per annum. Mr. D. W. Swan is Chairman, and Mr H. Vickers, of Coreen, Honorary Secretary. A vigorous policy will be necessary to retain this large membership and justify the fee charged.

Dubbo.

Messrs. T. Wilkins, S. Tripp, and W. W. Baird are the latest members of the branch. The subscription has been fixed at 2s. 6d. per annum, and the Hon. Secretary reports that strong efforts are to be made to place before the farmers of the district the value of the Bureau.

Arrangements are being made for a lecture on "Fruit-growing," to be delivered in January.

Dunedoo.

The agriculturists of Dunedoo have formed a branch in their district, the Chairman being Mr. A. H. Macdougall, of Craboon; Vice-Chairman, Mr. C. E. Paine, of Dunedoo; Treasurer, Mr. C. J. Rudder; and Honorary Secretary, Mr. G. E. Alexander. The subscription has been fixed at 2s. 6d. per annum, and twenty-six members have joined.

Forest Creek.

This branch is making use of the Department by sending in specimens of weeds and insects for identification, an example which might be followed with good results by other branches of the Bureau.

At the October meeting Mr. W. Thompson, the Honorary Secretary, read a paper on "Birds—Useful and Otherwise." He uttered a caution against the indiscriminate slaughter of birds, and advised that when a doubt existed as to whether certain birds were useful or otherwise, they should be carefully watched and their food supply noticed. The purely insectivorous birds should be protected, and although others, such as the magpie, chough, silver eye, and bee-eater, did a certain amount of damage, he considered they were on the whole deserving of special care and protection, on account of the large number of insect pests they devoured. Mr. Thompson had a good word to say even of

the crow as a scavenger, and considered that the use of the poison cart was a cause of loss instead of gain, as it led to the destruction of a large number of birds which otherwise would have maintained a balance in nature. The absence of bird life led to an undue multiplication of insect pests. In connection with the subject, members of the Bureau will be interested in the series of illustrated articles which are now appearing in the *Agricultural Gazette.*

The regular meeting day is the second Saturday in each month, at 3 p.m.

Mr. Chudleigh read a paper on "Destruction of Rabbits" at the meeting held on 11th November, which was followed by a discussion on the best means of dealing with the pests. The general opinion was that netting and "digging out" were the most effective methods.

Gunning.

At a public meeting held at Gunning on the 28th October it was decided to form a branch of the Agricultural Bureau. Mr. T. Starr was elected Chairman; Mr. A. E. Finch, Honorary Treasurer; and Mr. E. H. Turner, Honorary Secretary.

Katoomba.

Messrs. McAvemy, J. Knight, and M. Martin have joined the branch.

Kellyville.

Numerically this branch is very strong, possessing fifty-six members. The officers intend making it the strongest branch in the State, and to carry this intention into effect will necessitate a vigorous policy of useful work amongst the orchardists and poultrymen of the district.

Little Plain.

The Sheep and Wool Expert, Mr. Mathews, gave a demonstration on the 9th November, before an interested audience.

Lower Lawrence.

At a recent meeting the subject for discussion was "Winter Fodders," and members exchanged their experiences.

This branch is the fortunate possessor of a lady member, Miss McQueen. It should be Miss McQueen's vocation to see that the members do not neglect the social side of the Bureau's functions.

Milbrulong.

On the 1st November Mr. T. G. Palgrave, M.R.C.V.S., Veterinary Officer, lectured in the Public Hall on "Diseases and Accidents of Horses." The lecturer dealt with colic, strangles, and minor accidents, and answered many questions. Despite the very unfavourable weather, twenty-five members attended.

Penrose.

A branch has been formed here with fourteen members. Mr. W. Roberts is the Chairman; Mr. G. Johnson, Vice-Chairman; Mr. G. W. Johnson, Hon. Treasurer; and Mr. L. Pieremont, Hon. Secretary. Meetings are to be held the first Monday evening in each month, and the subscription has been fixed at 1s.

Sackville.

The annual subscription has been fixed at 2s. Twenty-five members have been enrolled, and many of them are taking advantage of the Department's offer to supply them with useful literature.

Wagga.

Mr. G. M. McKeown, the Manager of the Wagga Experiment Farm, on the 21st October, gave another instructive lecture to the members on "Noxious Weeds and Plants." Mr. E. Crouch, the Chairman, presided, and there was a good attendance. Mr. McKeown showed specimens of the various weeds with which he dealt, and gave advice concerning their treatment. Many of the members brought specimens of weeds for identification.

Further meetings of this branch will not be held until after the harvest.

Walla Walla.

The demonstration of budding and grafting grape vines by the Superintendent of the Howlong Viticultural Station was arranged for 30th November, at Mr. A. J. Wenke's farm. Mr. White visited Walla on the 25th October for the purpose of preparing the vines to be budded.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (imp).	Wollongbar Farm	*
" ...	March Pansy ...	Earl March ..	Australian Pansy.	Grafton Farm ...	*
" ...	Royal Pansy ...	Royal Hampton 10th (imp.).	Australian Pansy.	Tyagarah	31 Dec., '12.
Jersey ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	Wagga Exp. Farm	*
" ..	Jamaica Jack ...	Sir Jack	Rum Omelette (imp.).	Wollongbar Farm	*
" ...	Xmas Fox (imp.)	Silver Fox ..	Malvoisie .	Berry Farm ..	*
" ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ..	*
" ..	Grenadin ..	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
Guernsey .	The King's Mirror.	Calm Prince ..	Vivid (imp.)...	Casino	26 May, '12.
" ..	Star Prince ...	Calm Prince ..	Vivid (imp.)...	Lismore	31 July, '12
" ...	Sky Pilot ...	Prince Souvia ..	Parson's Red Rose (imp.).	Palmer's Island ..	15 Jan., '12.
" ..	Prince Souvia ...	Vivid's Prince..	Souvenir (imp.)	Casino	11 July, '12
" ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Milton	1 Feb., '12.
" ...	Monsieur Beaucaire.	Calm Prince ..	Flaxy (imp.)	Grafton Farm ..	*
" ..	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
" .	Claudius ..	Golden Star II..	Claudia's Pride (imp.).	H.A. College, Richmond	*
" ..	Prince of Warren Wood (imp.).	Kingsmoor Governor.	Quail... ..	Port Macquarie ...	20 Mar., '12.
" .	The Peacemaker	Calm Prince ..	Rose Petersen	Berry Farm ...	*
" ..	King of the Roses	Hayes' King ..	Rosey 8th (imp.).	Singleton	21 April, '12.
" ...	Calm Prince ..	Rose Prince (imp.).	Gentle (imp.)	Berry Farm ...	*
" ..	Royal Preel ..	Itchen Royal ..	Hayes' Lily du Preel (imp.).	Murwillumbah ..	10 Nov., '12.
" ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ..	Berry Farm ..	*
Ayrshire ..	Judy's Mischief	College Mischief	Kirkham Judy	Cowra Farm ..	*
" ..	Jamie's Ayr ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
" ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose..	H.A. College, Richmond	*
" ...	Julius Cæsar ...	Auchenbrain Spicy Jock (imp.)	Julia	Grafton Farm ...	*
Kerry... ...	Kildare II ..	Kildare (imp.)..	Belvedere Bratha 3rd (imp.).	H.A. College, Richmond	*
"	Bratha's Boy ..	Aicme Chin (imp.)	Bratha 4th .	" "	*
"	Rising Sun ..	Bratha's Boy ...	Dawn .	Bathurst Farm ..	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Copies of the Regulations under which the Government Bulls are leased may be obtained on application to the Under Secretary, Department of Agriculture, Sydney.

Department of Agriculture,
Sydney, 2nd December, 1911.

BULLS FOR SALE

BERRY STATE STUD FARM.

SHORTHORN.—Hamlet: sire, Royal Hampton X (imp.); dam, Panacea; calved 30th November, 1910; colour, red, Price, **£15.**

Panacea is by Dora's Boy from Pansy Girl. Pansy Girl is by Favourite (imp.) from Australian Pansy. Australian Pansy is by Airy Knight II from Pansy IV (imp.).

The Pansy strain has proved a good dairying one through several generations of cows.

JERSEY.—Sir John Flower: sire, Sir Jack: dam, Calceolaria (imp.); calved 2nd November, 1910; colour, whole. Price, **£30.**

Sir Jack is by Omelette's Pride from Lady Tidy III. Omelette's Pride is by Lucy's Pride from Rum Omelette (imp.). Lucy's Pride is by Melbourne (imp.) from Miss Lucy III (imp.).

Applications for these bulls will be held until 21st December. If more than one application be received for one bull, his disposal will be decided by ballot.

PURE-BRED GUERNSEY HEIFER FOR SALE.

BERRY STATE STUD FARM.

Name.	Sire.	Dam.	Date of Birth.	Price.
Venice	King of the Roses ...	Evening Star ...	16 October, 1910 ...	£ 50

This heifer will be sold only to a farmer resident in New South Wales.

H. C. L. ANDERSON,
Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1912.

Society.	Secretary.	Date.
Coramba District P., A., and H. Society	H. E. Hindmarsh..	Jan. 16, 17
Albion Park A. and H. Association	H. G. Fraser ...	" 17, 18
Kiama A. Association	R. Somerville ...	" 26, 27
Wollongong A., H., and I. Association	M. A. O'Donnell...	Feb. 1, 2, 3

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary.	Date.
Berry A. Association	C. W. Osborne	Feb. 7, 8
Moruya A. and P. Society	P. Flynn	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson	,, 13, 14
Manning River A. and H. Association (Taree)	S. Whitbread	,, 14, 15
Shoalhaven A. and H. Association (Nowra)	H. Rauch	,, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21, 22
Gunning P., A., and I. Society	J. R. Turner	,, 21, 22
Ulladulla A. Association (Milton)	J. Boag	,, 21, 22
Central Cumberland A. and H. Society (Dural)	H. A. Best	,, 23, 24
Quirindi District P., A, and H. Association	G. Fowler	,, 27, 28, 29
Dapto A. and H. Society	J. H. Lindsay	,, 27, 28
Inverell P. and A. Association	J. McIlveen	,, 28–Mar. 2
Hawkesbury District A. Association (Windsor)	H. S. Johnson	,, 29 Mar. 1, 2
Bangalow A. and I. Society	W. H. Reading	,, 5, 6, 7
Southern New England P. and A. Association (Uralla)	W. C. McCrossin	,, 5, 6, 7
Bega A., P., and H. Society	W. A. Zingel	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Warialda P. and A. Association	A. J. Devine	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	,, 7, 8
Nepean District A., H., and I. Society	P. J. Smith	,, 7, 8
Wauchope P., A., and H. Society	A. D. Suters	,, 7, 8
Narrabri P., A., and H. Association	D. J. Bridge	,, 7, 8, 9
Oberon A., H., and P. Association	A. E. Burcher	,, 8, 9
Wyong A. Association	J. H. Kay	,, 8, 9
Central New England P. & A. Association (Glen Innes)	G. A. Priest	,, 12, 13, 14
Campbelltown A. Society	F. Sheather	,, 13, 14
Cobargo A., P., and H. Society	T. Kennelly	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 13, 14
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 13, 14, 15
Bowraville A. Association	C. Moseley	,, 14, 15
Port Macquarie & Hastings Dist. A. and H. Society	W. R. Stacy	,, 14, 15
Goulburn A., P., and H. Society	J. J. Roberts	,, 14, 15, 16
Gundagai P. and A. Society	A. Elworthy	,, 19, 20
Gloucester A., H., and P. Association	S. J. Bignell	,, 20, 21
Queanbeyan P., A., H, and I. Association	E. C. Hincksman	,, 20, 21
Camden A., H., and I. Society	C. A. Thompson	,, 20, 21, 22
Newcastle A., H., and I. Association	C. W. Donnelly	,, 21, 22, 23
Moree P. and A. Society	D. E. Kirkby	,, 23, 24, 25
Blayney A. and P. Association	H. R. Woolley	,, 26, 27
Walcha P. and A. Association	J. N. Campbell	,, 26, 27
Tamworth A. and P. Association	J. R. Wood	,, 26, 27, 28
Molong P. and A. Association	W. J. Windred	,, 27
Cooma P. and A. Association	C. J. Walmsley	,, 27, 28
Yass P. and A. Association	W. Thomson	,, 27, 28
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 27, 28, 29
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 27, 28, 29
Liverpool A., H., and I. Society	W. E. Learoyd	,, 28, 29, 30
Adaminaby P. and A. Association	W. Delany	April 10, 11
Bathurst A., H., and P. Association	A. H. Newsham	,, 17, 18, 19
Hunter River A. and H. Association	E. H. Fountain	,, 17–20
Richmond River A., H., and P. Society (Casino)	D. S. Gayner	,, 23, 24, 25
Orange A. and P. Association (Jubilee Show)	W. Tanner	,, 24, 25, 26
Dungog A. and H. Association	C. E. Grant	May 1, 2.
Clarence P. and A. Society (Grafton)	G. N. Small	,, 8, 9, 10
Coonamble P. and A. Association	J. M. Rees	,, 8, 9
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 20, 21, 22
Corowa P., A., and H. Society	J. D. Fraser	,, 27, 28
Young P. and A. Association	G. S. Whiteman	Sept. 10, 11, 12

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